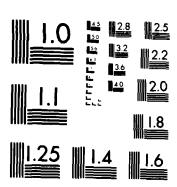
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FREFACE

The United States Army Medical Bioengineering Research and Development Laboratory (USAMBRDL), a subordinate unit of the United States Army Medical Research and Development Command (USAMRDC), is located at Fort Detrick, Maryland, at the apex of a triangle between Baltimore and Washington on the outskirts of the City of Frederick.

The unit was established on I September 1972 by the merger of the US Army Medical Equipment Research and Development Laboratory (USAMERDL) and the US Army Medical Biomedical Research Laboratory (USAMERL). On I July 1973, USAMERDL was directed to absorb the resources and mission of the US Army Medical Environmental Engineering Research Unit (USAMERRU), Located at Aberdeen Proving Ground (Edgewood Arsenal), Maryland. This action was completed on 30 October 1973, with the simultaneous discontinuation of USAMEERU and the formation of the Environmental Protection Research Division within USAMERDL. By September 1974, all of the division's personnel and material resources had been relocated to Fort Detrick.

Organized in September 1921 at Carlisle Barracks, Pennsylvania, the original USANERDL was established to provide engineering development of medical items required for field use of the Army. During the years 1946-1957 the laboratory was under the command of the former Army-Navy Medical Procurement Office, and in 1948 was moved to Fort Totten, New York. Subsequently, under the technical supervision of the Armed Services Medical Materiel Coordination Committee, it came under complete control of the Army in June 1962 as a subordinate element of The Surgeon General's Research and Development Command. USAMERDL through the years continued to develop and improve upon medical materiel peculair to the needs of the Armed Forces.

Established in 1946 by the Army Medical Service, the former USAMBRL was originally known as the Army Hand Laboratory, and later changed to Army Prosthetics Research Laboratory (APRL). During the early years, APRL research involved the development of new prosthetic devices. Around 1955, the research effort became more diversified and included the development of new surgical repair materials. With the expansion of the mission to include internal body prosthetics, the name of the laboratory was changed in 1963 to US Army Biomechanical Research Laboratory.

The former USAMEERU was activated on 1 July 1972. USAMEERU represented a major Army "first" in that its mission was to conduct continuing environmental health engineering research in support of The Surgeon General's responsibilities in air and water pollution control and abatement.

Today, USAMBRDL's facilities are housed in five separate buildings on Fort Detrick with total floor space exceeding 100,000 square feet.

With the enceptions that ISAMBRDI no longer performs research in the area of prostnetic devices or surgical materials and there is much greater emphasis on pest management research, current missions can be traced back to the original three laboratories. Not surprisingly, these missions reflect a highly laterdisciplinary staff and the need for a responsive and flexible management structure. Current missions are as follows:

Conducts in-house and extramural research, development and acquisition of medical, dental, and pest management material for use in non-contaminated is well as in chemically contaminated environment on a continuing basis for the Naw, and on an as required basis for the Navy and Air Force. This includes providing input to the medical material developer's portion of the fife Cycle System Management Model, and the Product Improvement Program, coordinating an integrated pest management program, constructing initial pilot prototypes and test models, and producing limited quantities of medical material to support organt military requirements.

Conducts comprehensive basic and applied research and management of extramural research in support of The Surgeon General's responsibilities in environmental quality protection to include air, land, and water pollution control and disposal of hazardous/toxic wastes and pesticides; and The Surgeon General's responsibilities in occupational health protection associated with Army personnel exposures to chemical hazards of military systems and operations, and military personnel exposures to chemical, biological and radiological contaminants associated with field water supply and sanitation.

To accomplish these missions, the laboratory is authorized 138 positions consisting of 20 officers, one warrant officer, 15 enlisted personnel, 93 general schedule civilians and nine wage grade civilians. In addition, the personnel complement is augmented through various cooperative training programs with universities, colleges and other government agencies. Professional disciplines represented in the organization include:

Aquatic Biology
Biostatistics
Biomedical Maintenance Technology
Chemistry
Analytical
Biochemistry
Polymer
Computer Sciences
Engineering Crafts and Drafting
Entomology
Environmental Microbiology

Engineering
Biomedical
Chemical
Electrical
Electronics
Mechanical
Sanitary/Environmental
Graphic and Photographic Arts
Operating Room Nursing
Pharmacology
Toxicology

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A GUABLE IN RESEARCH OF WASTEWAYER TREATMENT FOR REMOVAL OF TOXIC CONTAMINANTS OR CARCINGGENS FOUND IN MILITARY WASTE STREAMS FROM INSTALLATION PEST MANAGEMENT OPERATIONS OR MONITIONS-PRODUCTION FACILITIES

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DETAIL SHEET

TIME: Formation and Evaluation of Specific Adsorbent Surfaces

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resulting DEF141110A: this study involves the preparation of specific adsorbent surfaces on silica gel under acid pH and alaminum hydroxide in alkaline pH for ethal orange or methyl orange, and evaluation through the study of adsorption isotnerms. This study may lead to the study of the cross-linked heme and block copolymers for dyes and pesticides.

IMPORTANCE: This bondy is important in elucidation of the behavior of Si and Algels as template-like specific adsorbents, for any organic molecules. This behavior, if proved to be true, may lead to the preparation of high potency adsorbents for the collutants in asstewater. Such adsorbents may facilitate the treatment of Army amigne or relevant wastewater for removal of pesticides and other toxic substances.

APPROACH: The preparation and evaluation of silica gels in the presence of methyl or ethyl orange, and also, p-chlorophenyl methyl sulfone, in order to reproduce and establish the data available in the literature. Then the same technique may be established for other pesticides and pollutants. The silica gels can be modified by aluminum hydroxide or chlorosilicon compounds, to suit the adsorbent surfaces to the structure of the pollutants.

ACHIEVEMENTS: A protocol was prepared for the experimental work needed to confirm the specific results on silica gel adsorbents. A survey of the literature on the preparation of synthetic copolymers for specific adsorption was carried out. Five different silica gel adsorbents for ethyl orange and p-chlorophenyl methyl sulfone have been prepared. The study of their adsorption isotherms will be continued in FY82.

RELATIONSHIP TO CORE PROGRAM: The basic concept of producing a highly efficient specific adsorbent with capability of regeneration, is useful in the research program for removal of toxic contaminants that have been found in waste streams and ground water at Army installations.

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APROXICAL Income our instruction to tribby is available from Waters Associates, Inc., Miltord, MA. This decise, called SEP PAR c_{18} , is a small polyethylene distribute containing of the silica bonded with octadecylsilane. This cartridge fits onto a uner-lock syringe and a water sample containing pesticides at the ppB level is pushed through the SEP PAK cartridge. Elution of the SEP PAK with a small volume (1 ml) of methanol will release the absorbed pesticide.

ACHIEVEMENTS: SEP PAK C18 contridges effectively remove diazinon, ronnel, dursban, parathion, and photate (5, 10 and 50 pp8) from dilute aqueous solution. Elution of such a cartridge with a small volume of methanol gives an excellent recovery of the posticide in a more concentrated state. Since organophosphorus pesticides and nerve agents share in some chemical similarities, it should be possible to incorporate a simple adsorption decree late the PECTA kit in order to improve its sensitivity to water containing herve agents at levels below 0.02 mg/L.

RELATIONSHIP TO CORE EXOGRAT: USAMBRDL has just recently entered into the area of chemical defense. This IfIR effered an opportunity to respond rapidly to an immediate problem in this area.

INTENTIONS FOR FY82: The SEP PAK c₁₈ cartridge concentration technique will be oppified to dilote solutions containing nerve agents at 0.02 to 0.005 ppM level during a 52. One landred at of such a solution will be put through an adsorption cartridge. The absorbed nerve agent will then be eluted from the cartridge with 1 ml of methanol. The estate will go directly onto an acetylcholinesterase test ticket to determine the presence of an enzyme inhibitor.

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LECALL SHEET

Table: (19) Despairable nath of the heart sharinglensis var. israelensis in Added Addyrts and Significant victatum

ENAMERA HISTORY: AT A SKY ME A AND A ARE

2m391EM DEFINITION: Bacilias transfero is var. israelensis (Bti) is nearing become raial availability as the first even actual, effective biological control upon the compactness and timestime. Infinitive studies of its pathology and more of action have a type over rabilities.

IMPORTABLE Terminals on which the strability of this agent for use within the modifically peak management contact how a consider the mechanism by which it kills target peaks as well an artifical bilansay and field studies already underway.

APPROACH: Specimens exposed to Bti for different times will be prepared for histopathological examination by conventional light microscope and ultrastructural methods. Site of action and the development of pathology will be described. These observations should provide approaches to mode of action studies.

ACHTEVEMENTS: Bioassays have related dose to time of death, an essential first step in this project. Specimens were treated, collected at various times after treatment at selected dosages, and preserved for histological examination. Task was terminated due to permanent change of station for principal investigator. No results were obtained.

RELATIONSHIP TO CORE PROGRAM: This project involves development of a technology base in the mode of action of the emerging methodology for using insect pathogens as part of a comprehensive vector control program.

MANUSCRIFT: Dose-Response Studies of a New Species of Per Os and Vertically Transmittable Microsporidian Fathogen of Aedes aegypti from Thailand, by Stephen C. Hembree. For publication in Mosquito News.

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U) FISH : (U) TOXICANTS (U) AUTOMATED : (U) VENTILATORY : (U) SCREENING :

OBJECTIVE: (U) EVALUATION OF A SCREENING TEST DESIGNED TO ESTIMATE THE CHRONIC TOXICITY OF MATERIALS TO FISH BY A TECHNIQUE REQUIRING CONSIDERABLY LESS TIME AND EXPENSE THEN CURRENTLY AVAILABLE METHODS. THE TEST WILL BE USED IN CONJUNCTION WITH A PROGRAM TO ASSESS THE ENVIRONMENTAL HAZARDS ASSOCIATED WITH ARMY-RELEVANT MATERIALS.

APPROACH: (U) A MICROCOMPUTER BASED SYSTEM WILL BE USED TO MONITOR THE VENTILATORY PATTERNS OF 30 BLUEGILL SUNFISH EXPOSED IN GROUPS OF FIVE TO A SERIES OF TOXICANT CONCENTRATIONS. THE LOWEST CONCENTRATION AFFECTING THE VENTILATORY PATTERNS WILL BE COMPARED TO LITERATURE VALUES FOR THE LOWEST CONCENTRATION OF THE SAME TOXICANT AFFECTING BLUEGILL SURVIVAL, GROWTH OR REPRODUCTION DURING LONG-TERM EXPOSURE THE ABILITY OF THE VENTILATORY MONITORING SYSTEM TO PREDICT CHRONIC TOXIC EFFECT LEVELS WILL THEN BE DETERMINED.

PROGRESS: (U) 8010 - 8109. THE FIRST TOXICANT TEST WAS COMPLETED WITH THE PESTICIDE CHLORDANE. DATA INDICATE THAT SOME TOXICANT-RELATED EFFECTS MAY HAVE BEEN PRESENT AT THE HIGHEST CONCENTRATION TESTED (10 UG/L NOMINAL), BUT A SECOND TEST WILL BE REQUIRED TO CONFIRM THIS DUE TO ANALYTICAL DIFFICULTIES ENCOUNTERED AT THIS LEVEL OF EXPOSURE. VENTILATORY DEPTH DECREASED IN THE CONTROLS WITH TIME, BUT VENTILATORY RATE, GILL PURGE RATE, AND MOVEMENT RATES DID NOT SHOW ANY CONSISTENT TRENDS OVER TIME.

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DELANT SHEEF

TITT: Development of an Automated forheast Screening lest Based on the Ventilatory Responses of Fish

FUNDING HISTORY: Pr - 4K; P - 14K; BY - 6K

PROBLEM DEFINITION: Current methods for determining the chronic effects of toxic materials on fish are costly and time consuming. A faster, less expensive screening test to estimate chronic-effect levels would be quite useful. One possible method is based on recent evidence indicating a relationship between the concentrations of a toxicant causing chronic effect on fish growth, reproduction, and survival and the concentration causing abnormal fish ventilatory patterns. The goal of this project is to test this relationship using an automated system for monitoring the ventilatory signals of fish.

IMPORTANCE: The number of materials reaching the environment and posing a potential threat to aquatic organisms is continually increasing. Only a very small number can be rested using full life cycle tests with fish. The development of a sensitive screening test that could be used to estimate chronic toxic effect concentrations would save time, money, and would help set testing priorities so that limited resources could be used for those materials having the greatest potential toxicity.

APPROACH: An automated system has been developed to monitor the ventilatory patterns of 30 bluegill sunfish. Toxicants tested will be those for which the chronic toxicity to bluegills has already been determined. Comparison of these literature values with effect levels found in the ventilatory monitoring tests should indicate the usefulness of the monitoring system as a screening test for chronic toxicity.

ACHTEVEMENTS: The operation of the ventilatory system was evaluated in a test with the organochlorine pesticide chlordane. This test provided necessary information on acclimation time for the fish for each ventilatory parameter (ventilatory rate and depth, gill purge rate, and body movement), the relationship between computer-determined rates and those derived from visual analysis of the ventilatory signals, and on the nature of the bluegill's ventilatory responses to chlordane in water. An invited paper titled "Utilization of Aquatic Organisms for Continuously Monitoring the Toxicity of Industrial Waste Effluents" will be presented at the Twelfth Conference on Environmental Toxicology to be held in Dayton, Ohio in November 1981.

RELATIONSHIP TO CORE PROGRAM: An important part of this Laboratory's responsibility for determining the environmental hazards posed by manitions wastes and other Army-related materials is to estimate the effects of these materials on aquatic organisms.

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ANALYSIS (U) WASTEWATER

OBJECTIVE: (U) TO DEVELOP A RAPID FIELD METHOD FOR THE DETECTION OF TRACES OF PESTICIDES IN EFFLUENT FROM CARBON ARMY ADSORPTION/FILTRATION SYSTEMS AND SLUDGE TREATMENT SYSTEMS. THE METHOD MAY BE USED FOR DETECTION OF OTHER POLLUTANTS SUCH AS DYES, MUNITIONS, AND TOXIC SUBSTANCES IN WATER.

APPROACH: (U) RESULTS OF LITERATURE SEARCHES AND NEWLY DEVELOPED METHODS WILL BE COMBINED TO GIVE A THIN LAYER CHROMATOGRAPHIC PROCEDURE IN WHICH A SINGLE ADSORBENT AND A SOLVENT SYSTEM CAN BE USED TO SEPARATE MIXTURES OF ORGANOPHOSPHORUS AND CARBAMATE PESTICIDES. IN ADDITION A TECHNIQUE WILL BE DEVELOPED FOR QUANTITATION OF THE RESULTS AT THE TIME OF

PROGRESS. (U) 8010 - 8109. A THIN-LAYER CHROMATOGRAPHIC PROCEDURE, USING SILICA GEL AND HEXAME/ACETONE (V/V. 8/3), DEVELOPED IN THIS STUDY HAS BEEN USED AT THE ARMY'S FT. EUSTIS, VA PEST CONTROL FACILITIES TO SEPARATE MIXTURES OF PESTICIDES, INCLUDING BAYGON, DIAZINON, DURSBAN, DIMETHOATE, MALATHION, AND VAPONA. THE PROCEDURE WORKED. THE DETECTION LIMIT OF EACH PESTICIDE WAS FOUND AND COMBINED WITH THE VOLUME SPOTTED TO GIVE CONCENTRATION (PPM) OF THE PESTICIDES IN THE WASTE. MINIATURE CARTRIDGES WERE USED TO LOWER THE DETECTION LIMIT OF EACH SUBSTANCE

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DETAIL SHEET

TITLE: Development of Thire: Ver Chromatographic Procedures for the Rapid Analysis of Traces of Pesticides in Wastewider

FUNDING HISTORY: PY + 13; DY + 11, BY + 9

PROBLEM DEFINITION: To determine if chin-layer chromatography (TLC) can be used in the field as an unalytical technique for determining the quality of water produced by the treatment of aqueous posticide waste at Army pest control facilities.

iMPORAMOL. Federal, State, and DA regulations prohibit the discharge of pesticide waste into sower systems, but the soil, or into bodies of water unless the pesticide concentrations are below contain preestablished safe levels. To comply with these regulations, as well as reduce the storage of hazardous waste, Army pesticide waste treatment facility operators need a simple reliable system for determining the quality of treated wastewater and selecting the procedure for its disposal.

APPROACH: Chromatographic procedures found in the literature for specific pesticides will be evaluated and adapted to give a developing solvent mixture and adsorbent with potential for separation of mixture of pesticides.

ACHIEVEMENTS: A chromatographic system using thin-layer plates and developing solution of hexane/acetone was used to separate and detect the pesticides, Baygon, Chlordane, Diazinon, Dursban, and Malathion in aqueous waste. The system was used successfully in the field at Ft Eustis, VA, for the above pesticides. However, it also was used to effectively detect two other pesticides, Vapona and dimethoate that were thought to be in the aqueous waste. These seven pesticides represent a small percentage of the pesticides used at DA facilities, hence, a need exists to expand the number of pesticides to include more of the others commonly used by DA.

RELATIONSHIP OT CORE PROGRAM: Evaluation of the effectiveness of treatment programs is usually done in-house on expensive gas chromatographic equipment. This equipment is not suitable for field use. A need exists for a semiqualitative analytical system that can be operated successfully by anyone at a pest control facility. Because this Laboratory is designing and evaluating a treatment facility in its core program in response to a TRADOC request, a simple detection system would greatly facilitate the evaluation and be useful when such facilities are routinely updated.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) DETECTION ;(U) ENTEROVIRUSES ;(U) ELUTION ;(U) WORK

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DETAIL SHEET

TITLE: Evaluation of the Effect of an Antifoam Addition to Beef Extract Eluent on the Recovery of Enteroviruses from Water and Wastewater

FUNDING HISTORY: PY - 11; CY - 5; BY - 6

PROBLEM DEFINITION: The current standard method for virus assay employs filters to trap and concentrate viruses from water environments. Foaming which occurs during elution of these viruses from the filters interferes with the assay procedure.

IMPORTANCE: Improved ability to detect virus in various waters for R&D purposes; secondarily, to reduce the physical and aerosol hazards during elution of these filters.

APPROACH: To test the effects on the recovery of various enteroviruses of adding small amounts of antifoam to the beef extract eluent.

ACHIEVEMENTS: Two blocks of experiments (six samples/block) were completed to test for system variability using poliovirus as a model. This was followed by an optimum antifoam level study using seeded distilled water source and two randomized studies using a common, seeded, tap water source. Quadratic regression analysis of the results indicated that there was a significant effect on the recovery of virus when Antifoam B was added to the eluent. By hand cleaning glassware and filter holders, the recovery of poliovirus has increased from 62.5% to 82.2% using beef extract alone. With the addition of 0.15 - 0.2% Antifoam B (sonically dispersed) to the beef extract eluent, the recovery of virus approached 100% (99.1% + 5.3%).

RELATIONSHIP TO CORE PROGRAM: This work will provide improved capability for virus assay in the ongoing evaluation of the Reverse Osmosis Water Processing Unit (ROWPU) that this Laboratory is conducting for USAMERADCOM.

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RETRIEVAL TERMS ASSIGNED BY DITC (b) BIDDETERIORATION :(U) ENZYMES ;(U) BACTERIA ;(U)
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DETAIL SHEET

TITLE: (U) Bacteriological Mechanism of 1,3-Dinitrobenzene Biodegradation

FUNDING HISTORY: PY - OK; CY - 8K; BY - 11K

PROBLEM DEFINITION: The purpose is to identify the microorganism or microorganisms responsible for the biodegradation of 1,3-dinitrobenzene, elucidate microbial interactions should more than one microorganism be responsible, and identify the major pathway for the metabolism of the compound.

IMPORTANCE: The importance of the biodegradation of 1,3-dinitrobenzene as a maritions-related pollutant in general, and specifically as a nitroaromatic shemical empound. Hies in understanding the means by which the biodegradation is accomplished. Previous studies indicate that the compound is only partially biodegraded and will not serve as a sole source for microbial growth, but a mixed culture has been developed at USAMBRDL which will grow on and completely degrade the compound. Organisms within this culture must have the capability to modify or remove nitro substituents and to cleave to the modified benzene ring product. An understanding of the organisms and enzyme systems involved could serve as a starting point for the development of atrains of microbes cap ble of degrading a variety of nitro-substituted benzene derivatives.

AFPROACH: Mixed culture microorganisms growing in 1,3-dinitrobenzene, as a sole carbon source, will be plated, purified, and reinoculated into medium containing the compound. Organisms growing on the compound as pure cultures, or in known combinations, will be identified by standard bacteriological techniques. Pure cultures of bacteria involved in the biodegradation will be studied to identify the major intermediates leading to cleavage of the benzene ring. In addition, the oxygenase involved in cleavage of the ring will be identified.

ACHIEVEMENTS: Studies indicate that 1,3-dinitrobenzene agar alone will not serve as a plating medium for microorganisms from the mixed culture. Three organisms have been isolated from the culture on standard bacteriological media which will degrade the test chemical but appear to lose the capability following repeated passage. A solid support medium composed of 1,3-dinitrobenzene and yeast extract has been developed and used to isolate organism which will grow on 1,3-dinitrobenzene following reinoculation of liquid medium. The isolate is being tested for its stability in degrading 1,3-dinitrobenzene following repeated passage on the new solid support medium. Should it prove to be stable, biochemical studies will be initiated.

RELATIONSHIP TO CORE PROGRAM: The environmental fate of 1,3-dinitrobenzene along with other munitions-related compounds is currently under study at USAMBRDL. Contrary to reports in the literature, a mixed culture has been developed which will grow on and completely degrade the compound. The purpose of this ILIB proposal is to extend and elucidate microbiology of that study.

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DETAIL SHEET

TITLE: Mechanistic Investigation of Disinfection by Chlorine Dioxide Generated in situ

FUNDING HISTORY: PY - OK; CY - 7K; BY - OK

PROBLEM DEFINITION: Acidification of solutions of chlorite salts has long been known to produce ${\rm Cl}\,0_2$ and chlorate ion. More than a decade ago, extensive investigation of the kinetics of disproportionation of chlorous acid both in the absence and presence of chloride ion strongly supported a mechanism in which the highly reactive species ${\rm Cl}\,{\rm -Cl}\,0_2$ is a key intermediate. A comparative product study of the oxidation of p-chlorobenzldimethylamine by ${\rm Cl}\,0_2$ alone and by ${\rm Cl}\,0_2$ generated in situ showed the reaction took two different courses, and indicated in the latter case the probable involvement of a different oxidizing species which led to the formation of carbon radical intermediates. The proposed study is designed to implicate ${\rm Cl}\,{\rm -Cl}\,0_2$ as the in situ, carbon radical precursor.

IMPORTANCE: Although it is widely known that use of chlorine dixoide (ClO₂) as an alternative to chlorine in water disinfection does not lead to haloform residues, little information is available as to the identities of and possible health hazards due to a variety of other organic compounds, chlorinated and nonchlorinated, shown to be present in certain ClO₂-treated waters. Reactions of ClO₂ with certain classes of compounds, notably amines, phenols, and olefins have been investigated in some detail, but the studies were not carried out under water treatment conditions. Thus, in order to facilitate assessments of relative safety, further knowledge of the aqueous organic chemistry of ClO₂ is essential.

APPROACH: A simple experiment was designed to trap the intermediate C1-C102 by reaction with a trichloromethyl radical derived from chloroform to give carbon tetrachloride. When this was unsuccessful, a second approach, involving a comparative product study of the reactions of N,N-dibenzylethylglycinate with C102 alone and with C102 generated in situ, was pursued.

ACHIEVEMENTS: The comparative studies, over a range of pH and time, showed no substantial differences in product distribution at a given pH and time, between ${\tt ClO_2}$ alone and ${\tt ClO_2}$ generated in situ. Thus, the intermediacy of ${\tt Cl-ClO_2}$ in the latter cases could not be verified. However, a finding of potentially greater significance to the use of ${\tt ClO_2}$ as an alternative water disinfectant emerged from the study: amides, not previously observed in ${\tt ClO_2}$ oxidations of amines, were important products (along with the expected products of oxidative dealkylation). A publication detailing this finding is in preparation.

RELATIONSHIP TO CORE PROGRAM: A major function of the Laboratory has been to conduct environmental fate studies necessary for hazard assessment of the release of a variety of trace organic pollutants to wastewater. Before any hazard assessment of the use of ${\rm ClO}_2$ as an alternative disinfectant can be made, the resulting trace organics must be identified. Basic studies of the mechanisms of product formation in model systems will be useful in accurately predicting expected products and in varying conditions to minimize any potentially hazardous ones.

PEST MANAGEMENT SCIENCE BASE

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OBJECTIVE: (U) TO DEVELOP AND MAINTAIN A PEST MANAGEMENT SCIENCE BASE WHICH WILL (A) ENSURE THE APPLIED RESEARCH PROGRAM IS CURRENT IN NEW DEVELOPMENTS IN PEST MANAGEMENT, AND (B) DEVELOP NEW MILITARILY UNIQUE APPROACHES TO INTEGRATED PEST MANAGEMENT.

APPROACH: (U) THROUGH USE OF IN-HOUSE EXPERTISE AND EXTENSIVE INTERRELATIONSHIPS WITH OTHER GOVERNMENT AGENCIES AND THE PRIVATE SECTOR, BASIC RESEARCH WILL BE CONDUCTED IN THE AREA OF INTEGRATED PEST MANAGEMENT. APPROACH WILL BE CENTERED ON MILITARILY UNIQUE ASPECTS OF THE PROGRAM.

PROGRESS: (U) 8012 - 8109. A VARIETY OF VECTOR CONTROL TECHNIQUES WERE IDENTIFIED AS HAVING FOTENTIAL FOR MILITARY USE. INCLUDED WERE UTILIZATION OF LIQUID PESTICIDE FORMULATIONS AT LESS THAN CONVERSATIONAL DOSAGES. POSSIBILITIES OF AERIAL DISPERSAL OF BIOLOGICAL CONTROL ENTITIES. EVALUATIONS OF MICROBIAL CONTROL POTENTIAL OF A HELICOSPORIDIUM SP. FOR AEDES AEGYPTI AND CULEX QUINQUEFASCIATUS AND OBSERVATIONS ON THE VERTICAL TRANSMISSION OF A NEW MICROSPORIDIAN PATHOGEN OF AEDES AEGYPTI.

PROCESSING DATE: 06 JAN 82

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TITLE: (U) Pest Management Science Base

FUNDING HISTORY: PY - 0; CY - 87K; BY - 97K

PROBLEM DEFINITION: The military historically has adopted particular technologies long after they have been proven in the civil sector. This concept has created a lag that has often resulted in the military acquiring outmoded technology. As the technology advances at an even greater rate, the resultant lag becomes greater so that the problem compounds itself.

IMPORTANCE: The military must have state-of-the-art technology in order to perform its mission to support the combat soldier. Attempting to combat vector-borne diseases with outmoded technology will result in inefficiency, wastefulness, and failure to carry out the mission.

APPROACH: Through use of in-house expertise and extensive interrelationships with other government agencies and the private sector, basic research will be conducted in the area of integrated pest management. Approach will be centered on militarily unique aspects of the program.

ACHIEVEMENTS: A variety of vector control techniques were identified as having potential for military use. Included were utilization of liquid pesticide formulations at less than conversational dosages, possibilities of aerial dispersal of biological control entities, evaluations of microbial control potential of a Helicosporidium sp. for Aedes aegypti and Culex quinquefasciatus and observations on the vertical transmission of a new microsporidian pathogen of Aedes aegypti.

RELATIONSHIP TO CORE PROGRAM: This project is a vital part of a comprehensive vector control program, ensuring a steady stream of new, innovative, and often novel approaches to effective control of arthropod vector populations.

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REPORT NO. FHP24C

TITLE: (U) Delousing Outfit, Power-Driven

FUNDING HISTORY: FY - 0; CY - 11K; BY - 69K

PROBLEM DEFINITION: The current standard Delousing Outfit, Power-Driven, was initially designed during World War II. The delousing outfit does not apply consistent rates of pesticide. This deficiency has been reported as a potential health hazard in conjunction with several field experiments.

IMPORTANCE: Delousing outfits, power driven, are utilized during military operations for control of outbreaks of body lice which precede epidemics of typhus. Delousing outfits will be used to prevent devastating outbreaks of typhus which previously have characterized all armed conflicts in the European theater.

APPROACH: Using standard military and commercial components, the militarily unique delousing outfit will be reengineered. It will be lighter and less bulky, and the guns and nozzles will be specifically designed for uniform dust dispersal.

ACHIEVEMENTS: A Product Improvement Program (PIP) has been conducted on the current delouser. A PIP unit will be tested to ascertain if these modifications adequately improve the existing delousing outfit.

RELATIONSHIP TO CORE PROGRAM: The PIP will update the current Delousing Outfit, Power Driven, available for use in the field.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) CONTROL ;(U) BIOLOGY ;(U) RATES ;(U) PESTICIDES ;(U)

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TITLE: (U) Pesticide Formulations, Controlled-Release, Environmentally Compatible

FUNDING HISTORY: PY - 87K; CY - 90K; BY - 102K

PROBLEM DEFINITION: To develop and register long-lasting and environmentally compatible pesticide formulations.

IMPORTANCE: Controlled-release environmentally degradable pesticide formulations systems are needed to replace the long-lasting, broad-spectrum pesticides, like DDT, that have been cancelled or suspended. The current formulations of new compounds are short-lived and have relatively short shelf life, thus are overall militarily less acceptable. These shortcomings can be overcome through application of a controlled-release formulation. This should result in reduced pesticide use, an important aspect of military vector control programs.

APPROACH: Controlled-release pesticide formulation system envisions the formulation of pesticides into carriers having chemical or physical characteristics that release the pesticide at a predetermined rate into the environment so that, after a given time, the pesticide and carrier are completely degraded.

ACHIEVEMENTS: Abate biomodal controlled-release pellets were tested in the laboratory and found to be effective for over 34 weeks. Dursban silicate controlled-release silicate pellets were tested in the laboratory and found to be effective for at least 27 weeks. Weekly water samples were taken to analyze these values to the larval mortality.

RELATIONSHIP TO CORE PROGRAM: This project is involved in evaluation and field testing of several new pesticide formulations. Outcome will provide the military with a new series of effective pesticides that are registered for medically important arthropods.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) FORWARD AREAS; (U) TEST EQUIPMENT; (U) LABORATORY EQUIPMENT; (U) *MEDICAL EQUIPMENT; (U) LIGHTWEIGHT; (U) MODULAR CONSTRUCTION; (U)

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TITLE: (U) Field Clinical Analysis System

FUNDING HISTORY: PY - 22K; CY - 40K; BY - 19K

PROBLEM DEFINITION: To develop a modular, portable, and integrated clinical analysis system for the determination of clinically important body fluid parameters in a field environment.

IMPORTANCE: Currently used equipment is a mixture of various commercial equipment that has not been designed to operate in the field. Additionally, the use of different manufacturers' equipment for the same determination increases the logistic, training, and maintenance problems.

APPROACH: A determination of the various tests and location in the medical care chain will be determined. A survey of the procedures available to make the desired test will be made. Then a system will be developed that will use common procedures for as many tests as possible and that will provide a modular and integrated system.

ACHIEVEMENTS: Two lists of tests, one for "sick-call" and one for combat casualties, have been obtained and compared for duplication. The tests have been grouped according to the determination method used. A survey of commercial items is under way. A dry slide technology is developing but, as yet, will not satisfy the stated requirements.

RELATIONSHIP TO CORE PROGRAM: This program is directly related to the Laboratory's mission of developing field medical equipment.

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TITLE: (U) Patient Decontamination Apparatus

FUNDING HISTORY: PY - 0; CY - 82K; BY - 80K

PROBLEM DEFINITION: The use of toxic chemical agents (TCA) on the integrated battlefield will produce large numbers of chemically contaminated patients. Currently, the US Army does not have any equipment to decontaminate chemically contaminated patients.

IMPORTANCE: It is important to decontaminate patients quickly to save lives, reduce effects of TCA, and to prevent contamination of medical personnel.

APPROACH: Methods, equipment, and materials used by industry and foreign military organizations are being reviewed. Based on investigations and current doctrine, breadboard models are under development.

ACHIEVEMENTS: A breadboard washing system using a modified Army litter, pump, and water collector was fabricated and sent to field units for evaluation.

RELATIONSHIP TO CORE PROGRAM: The program directly relates to the Laboratory's mission to develop field medical material.

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ACHIEVALENCE: Purchase appointions for CaPam Caloride word reviewed and comments were forwarded to task force. Vibration tests on Mark I coupler were unitiated and completed during 4QSC.

RELATIONSHIP TO CORE PROGRAM: The program is directly related to the Laboratory's mission to develop field medical material.

RETRIEVAL TERMS ASSIGNED BY DTIC (U) PERSONNEL MANAGEMENT ;(U) PATIENTS ;(U) NUCLEAR WARFARE ;(U) MEDICAL EQUIPMENT ;(U) MATERIEL ;(U) FIELD EQUIPMENT ;(U) CHEMICAL WARFARE ;(U)

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TITLE: (U) Evaluation of Foreign Medical Materiel for Use in a Contaminated Environment

FUNDING HISTORY: PY - 27K; CY - 12K; BY - 20K

PROBLEM DEFINITION: Several foreign countries have developed doctrine/ technology/material for patient handling and treatment in contaminated field environments (nuclear, biological, and chemical). To improve AMEDD's casualty management capabilities rapidly and effectively, observance and evaluation of selected foreign medical material will be addressed.

IMPORTANCE: AMEDD's doctrine for treatment and handling of field patients is currently being upgraded. Evaluation of foreign materiel would improve, enhance, and speed up positioning of critical materiel to field elements.

APPROACH: Intelligence documents are constantly reviewed for possible candidate material.

ACHIEVEMENTS: British materiel (MARK III and MARK IV) for use in fabricating patient protective evacuation bags is being used by NATICK Labs. Comparison of chemcial protection of British materiel is being conducted by NATICK Labs.

RELATIONSHIP TO CORE PROGRAM: The program is directly related to the Laboratory's mission to develop field medical material.

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- (U) Medical Equipment; (U) Field Medicine; (U) Testing
- 23 TECHNICAL OBJECTIVE. 24 APPROACH, 25 PROGRESS (Furnish Individual paragraphs identified by number precede text of each with Security Classification Code.
- 23. (U) To technically evaluate medical items and systems developed by another service, a foreign nation, or a commercial firm. Results provide input for requirement documents, development plans, or product improvement proposals.
- 24. (I) Specific items are evaluated for military relevancy after initiation by letter request from major commands, Military Intelligence Information Agency, or Department of Defense activities. Test protocols are written for each item evaluated and a final report written outlining specific recommendations.
- 25. (U) 8012-8109. Task has been inactive during the period with most of the studies initiated here having been converted to requirements documents. Task terminated due to uncertainty over new work in this category.

TITLE: (U) Technical Feasibility Testing of Medical Equipment

FUNDING HISTORY: PY - 55K; CY - 29K; BY - 0

PROBLEM DEFINITION: To conduct an ongoing program of evaluating promising items of foreign or commercial medical equipment and instrumentation for possible application in the field. This effort also serves to maintain a technology base for the Laboratory.

IMPORTANCE: From time to time new and interesting developments come to light in medical equipment having potential importance to the Army. These developments may come from the commercial market or may surface from intelligence sources. A mechanism must exist for conducting preliminary evaluations of such equipment without being driven by specific requirements.

APPROACH: To maintain an open work unit, funded at a modest level, which will permit periodic market surveys, evaluation of intelligence reports on foreign equipment, and the occasional procurement and evaluation of items of interest. The task also allows for the investigation of complaints against existing field equipment to provide a comparison base for evaluating new ideas and equipment.

ACHIEVEMENTS: This task was inactive during the FY 81 period, with most of the investigations undertaken during the previous FY having been converted to firm requirements.

RELATIONSHIP TO CORE PROGRAM: This task is consistent with the Laboratory's mission to develop medical field equipment.

UNCLASSIFIED

RETRIEVAL TERMS ASSIGNED BY DTIC (U) ARMY PERSONNEL; (U) CHEMICAL WARFARE CASUALTIES; (U) INDUSTRIES; (U) MATERIEL; (U) MEDICAL EQUIPMENT; (U) RESUSCITATION; (U) VENTILATION

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DTIC FORMAT 850

UNCLASSIFIED

TITLE: (U) Resuscitation Device, Individual, Chemical

FUNDING HISTORY: PY - 0; CY - 2K; BY - 19K

PROBLEM DEFINITION: No equipment exists today that can ventilate a chemical warfare casualty using the "Buddy-aid" system. Personnel overcome by a chemical agent attack will require ventilation assistance.

IMPORTANCE: Providing lightweight and mechanical equipment to front-line troops will help a number of chemical agent casualties to be revived and maintained until proper medical assistance can be provided.

APPROACH: Designs that will not expose casualties to further contamination are being investigated. Current efforts are being expended and investigated to develop a system whereby the casualty's mask is not removed and pressurized aid is provided by a mechanical hand-operated device.

ACHIEVEMENTS: Design, fabrication, and evaluation of the first breadboard model have been accomplished with fair results.

RELATIONSHIP TO CORE PROGRAM: The program is directly related to the Laboratory's mission to develop field medical material.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) CHEMICAL AGENTS; (U) CHEMICAL ATTACK(DEGRADATION); (U)

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DTIC FORMAT 850

TITLE: (U) Hardening of Medical Materiel Against Chemical Warfare Agents

FUNDING HISTORY: PY - 0; CY - 3K; BY - 30K

PROBLEM DEFINITION: AMMED capabilities to achieve its mission on the integrated battlefield depends on the contamination survivability of mission essential material.

IMPORTANCE: Current AMMED materiel will not survive contamination by toxic chemical agents (TCA) and decontamination solutions without loss of essential and RAM characteristics.

APPROACH: Develop hardened transport cases that will prevent contamination of medical materiel. Quick-fix improvements to current medical supply chests will protect most medical materiel for the near term.

ACHIEVEMENTS: New gasket (seal) for medical supply chest is under development. Handles and latches on medical supply chest are under study to harden for ease of decontamination.

RELATIONSHIP TO CORE PROGRAM: The program is directly related to the Laboratory's mission to develop field medical material.

COMBAT MEDICAL MATERIEL

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OBJECTIVE: (U) TO IDENTIFY A COMMERCIALLY AVAILABLE, LIGHTWEIGHT, DURABLE, PORTABLE UNIT CAPABLE OF DISPERSING ULV PESTICIDE FORMULATIONS. THIS UNIT WOULD BE USED BY PREVENTIVE MEDICINE PERSONNEL IN COMBAT ZONES AND CONUS FOR CONTROLLING DISEASE VECTORS AND PEST ARTHROPODS.

APPROACH: (U) A REVIEW OF COMMERCIALLY AVAILABLE PORTABLE ULV UNITS WILL BE MADE. SUITABLE UNITS WILL BE FIELD EVALUATED AFTER ENTOMOLOGICAL FEASIBILITY HAS BEEN ESTABLISHED, MODIFICATIONS, IF NECESSARY, WILL BE MADE AND FORMAL TESTING COORDINATED WITH RESPONSIBLE AGENCIES.

PROGRESS: (U) 8010 - 8109. EVALUATIONS INDICATE GASOLINE ENGINE UNIT MANUFACTURED BY MICRO GEN IS THE BEST AVAILABLE UNIT. RECOMMENDATION TO PURSUE NDI STRATEGY WILL BE MADE IN FY82.

PROCESSING DATE: 30 NOV 81

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TITLE: (0) Sprayer, Powered, ULV, Portable

FUNDING HISTORY: PY - 0; CY - 8K; BY - 16K

PROBLEM DEFINITION: To evaluate commercial hand-held ULV sprayers for adoption of an acceptable item into TOE units.

IMPORTANCE: Previous experiences in Southeast Asia and the Mideast have demonstrated the devastating effect outbreaks of arthropod-borne diseases can have on field operations. Many outbreaks start from a small localized area, too big for a field sanitation team to handle but too small for efficient treatment using current Corps equipment. To fill this technical gap, a small portable ULV sprayer could be used for local control of flies and mosquitoes.

APPROACH: To evaluate several commercially available hand-held ULV sprayers which are either gasoline engine driven or battery powered. Units that pass engineering criteria will be subjected to NDI strategy.

ACHIEVEMENTS: Feasibility/developmental testing of gasoline engine driven and battery-powered units completed. A gasoline engine model made by the Micro-Gen Corporation (San Antonio, TX) for the Navy has been selected as a more promising item.

RELATIONSHIP TO CORE PROGRAM: Project involves engineering and operational evaluation of insecticide dispersal equipment for inclosure in TOE of field medical units.

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TITLE: (U) Bag, Patient Holding and Evacuation, Prototype Design and Fabrication

FUNDING HISTORY: PY - 120 K; CY - 20K; BY - 38K

PROBLEM DEFINITION: The present means of protecting sick and injured personnel in cold environments from additional complications resulting from exposure to the cold is inadequate from the point of infliction through the evacuation system.

IMPORTANCE: Protection against exposure to cold must be provided through the evacuation organization until the patient can be moved by a temperature-controlled transportation medium or definitive treatment begins.

APPROACH: After problem definition, a number of proposals were evaluated before awarding a contract for prototype propane or propylene-fired heated liners to be placed inside medical evacuation bag. A second contract was awarded for prototypes of smaller, belt-mount versions of this system.

ACHIEVEMENTS: Functional problems encountered with the propane-fired heater unit have been assessed as nontrivial. The company which developed this equipment has gone out of business, which complicates the problem. Meanwhile, a Norwegian charcoal-fired heating unit has surfaced, and a specimen is being procured for evaluation.

RELATIONSHIP TO CORE PROGRAM: This task is consistent with the Laboratory's mission to develop medical field treatment and evacuation equipment.

UNCLASSIFIED

RETRIEVAL TERMS ASSIGNED BY DTIC (U) COMMERCE ; (U) SOURCES ; (U) FIELD CONDITIONS ; (U)

MEDICAL EQUIPMENT : (U) EYEGLASSES : (II) KITS : (II) ADMY DEPONDED : (II) EYE : (II) REPROTECTED.

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TITLE: (U) Optometry Set, Field, Combat

FUNDING HISTORY: PY - 108K; CY - 125K; BY - 57K

PROBLEM DEFINITION: To modernize and update the Field Optometry Set and to replace components which are no longer available from commercial sources with new designs.

IMPORTANCE: A functional optometry set is required for the use of optometry personnel assigned to the medical battalion providing division level medical support and other teams providing optometry services.

APPROACH: To design and evaluate engineering prototypes for test, technical data packages, and type classification.

ACHIEVEMENTS: The complete optometry set has successfully completed OT III. Final drawings are being produced for type classification.

RELATIONSHIP TO CORE PROGRAM: The Optometry Set is an integral part of the medical material program.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) CULICIDAE ; (U) COMMERCIAL AIRCRAFT ; (U) AIRCRAFT ; (U)

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TITLE: (U) Pesticide Dispersal Unit, Solid, Helicopter Slung

FUNDING HISTORY: PY - 26; CY - 125K; BY - 57K

PROBLEM DEFINITION: To adapt a commercial item capable of dispensing solid pesticide formulations for use in the military operation environment.

IMPORTANCE: Medical personnel engaged in field operations need the capacity for aerial dispersal of solid pesticide formulations to ensure rapid treatment of large areas inaccesible by ground equipment but too small for efficient use of larger aerial dispersal equipment. Currently, field units have no item of equipment with the capability, although their mission and TOE require it.

APPROACH: A commercially available spreader which is slung beneath a helicopter on the helicopter's cargo hook is being adapted for military use.

ACHIEVEMENTS: Developmental and operational testing have been completed. Work on the hardware is completed. Tasks remaining to be accomplished involve Basis of Issue and MOS decisions which must be approved by the Department of the Army prior to type classification.

RELATIONSHIP TO CORE PROGRAM: Project involves evaluation and modification of commercial unit as a military standard item. Item will replace current obsolete standard TOE item. Project is in concert with pest control equipment program.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) FIELD EQUIPMENT ; (U) URETHANES ; (U) SUPPLIES ; (U)

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TITLE: (U) Environmental Protection Containers for Medical Supplies

FUNDING HISTORY: PY - 62K; CY - 22K; BY - 43K

PROBLEM DEFINITION: To provide a means of storing biologicals which are subject to damage by freezing during field operations in arctic or subarctic regions.

IMPORTANCE: The present lack of a dedicated piece of equipment to cope with this problem has led to spoilage of large quantities of biological materials in Alaska. Present methods of preserving freezables are makeshift and totally inadequate.

APPROACH: To develop a light-weight, insulated chest that includes electrical strip heaters and a temperature control circuit. This chest, issued to appropriate field units, would be dedicated to the storage and preservation of freezable medical materials. The chest is also to be designed to protect freezables during several hours of unpowered transport.

ACHIEVEMENTS: Modifications required to the prototype as a result of maintenance evaluation have made it desirable to refabricate the prototype. That effort is under way.

RELATIONSHIP TO CORE PROGRAM: This equipment performs an ancillary function related to medical treatment in a field environment. The development of field treatment is a primary function of this research area.

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- 23. (0) To design and fabricate a new portable dental operating chair for Army field use, incorporating lightweight materials.
- 24. (U) Design. fabricate, and evaluate a suitable chair.
- 25. (U) 8010 8109. Supplemental to testing was conducted at Fort Carson, CO, from 30 September to 13 November 1980. Conclusions reached after this test was that the prototype did not meet the characteristics. At an IPP held ! September 1981, the concerneded course of action was to discontinue further developmental effort.

. Chair and Stool Units, Dental Operating, Field

1995 - <u>Hislory: 27 - 65</u>8, 0% - 173, **by - 0**

API 15M NETRITION: A need of lets to replace the current Chair and Stool Thir, Danual Operations, Portable (MSN 6520-00-181-7349) with an item that will not do resemble the same processional/operational capabilities but that the less double require less maintenance/repair support, be lighter in that require less closure transportation space.

The purpose standard above and stool unit has become extremely that the characteristic and standard cost (from one response only) has righter since the standard item was placed into the supply system. In addition, the combat readiness and reliability of the chair is low, primarily one to the high repair rate to correct malfunctions of the hydraulic control capters. Morportability is difficult because the weight and bulk exceed the reappearability for the normal and person user team.

ISTROACH: Review of possible commercial sources revealed that none met the binnaphornatics established by the Letter Requirement (LR). A design and fobrit to a were accomplished by an in-house effort.

results to additional development testing (DT IIA) and another maintenance evaluation by USAMMA. Both were successfully concluded. In June 1980, prototype forwarded to the 4th Mechanized Infantry Division, Fort Carson, CO, for operational testing (OT IIa). Testing was instituted on 30 September 1980.

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TITLE: (U) Low Capacity Radiographic System, Field

FUNDING HISTORY: PY - 12K; CY - 6K; BY - 22K

PROBLEM DEFINITION: To identify suitable automatic film processors, compatible film, cassettes, and accessories for interfacing with a low capacity radiographic apparatus. To identify a suitable low capacity radiographic system for field medical use.

IMPORTANCE: Currently available wet X-ray film processors and accessories are not suitable for use by small medical units outside of field type hospitals based on weight, complexity, and utility requirements. The need is acute and critical for a film processor and a low capacity X-ray apparatus.

APPROACH: A survey of commercially available film processors and low capacity X-ray systems will be made to determine their ability to satisfy the letter requirement.

ACHIEVEMENTS: A market survey uncovered no commercial X-ray units that would meet the letter requirements. A request for proposals is being written for the commercial development of a low capacity X-ray system.

RELATIONSHIP TO CORE PROGRAM: This program is directly related to the Laboratory's mission of developing field medical equipment.

UNCLASSIFIED

RETRIEVAL TERMS ASSIGNED BY DTIC (U) FIELD CONDITIONS;(U) COMMERCE;(U) WORK;(U) SOURCES;(U) MEDICAL SERVICES;(U) MAINTAINABILITY;(U) FIELD FOULTPMENT.

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TITLE: (U) High Capacity Radiographic System, Field

FUNDING HISTORY: PY - 222K; CY - 78K; BY - 194K

PROBLEM DEFINITION: The current field radiographic system is inadequate in reliability, availability, maintainability and does not conform to the radiation requirements of 21 CFR.

IMPORTANCE: The lack of a working, reliable, certifiable, high capacity X-ray system to meet the radiological requirements of field medical treatment facilities has a significant impact on the ability of these activities to provide basic health care. The need is acute and critical.

APPROACH: A search of commercial sources will be made for a functional system or components that can be combined into a system that will meet the field requirements.

ACHIFVEMENTS: A survey was made of the commercial market. No commercial system was found that will meet the letter requirement. Commercially available components have been obtained and have been adapted and modified into a radiological system compatible with field requirements. This system is composed of a commercial control unit, transformer, X-ray source, and image intensifier system. These items have been matched to the Army 5090 field table. Film processing is provided by using a commercial wet processor with a daylight loader and a water recycling system. The system underwent operational testing during 1st Q FY 81. Of the 16 critical issues, 10 were satisfied fully and 4 partially. A redesign is under way.

RELATIONSHIP TO CORE PROGRAM: This program is directly related to the Laboratory's mission of developing field medical equipment.

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TITLE: (U) Litterboard

FUNDING HISTORY: PY - 76K; CY - 15K; BY - 0

PROBLEM DEFINITION: Litters available for use in a field environment are not sufficiently rigid for the proper management of back or cervical spine injuries. There is a need for a rigid litterboard/spineboard in the supply system for proper casualty management. The advice to fabricate locally, given in FM 8-35, has proven inadequate.

IMPORTANCE: The use of spineboards/litterboards in the proper management of back and cervical spine injuries is essential to sound medical treatment in the field to minimize the chance of further injury during transport.

APPROACH: The commercial market for these devices and accessories was searched both by advertisement in Commerce Business Daily and by letter to potential vendors. Characteristics of commercial items as well as in-house development will be evaluated against field requirements. It is hoped that a commercial device will adequately meet this need.

ACHIEVEMENTS: Work unit was completed with the technical data package forwarded to DPSC for procurement.

RELATIONSHIP TO CORE PROGRAM: The effective management of back and cervical spine injuries using litterboards/spineboards is consistent with the Laboratory's mission for field medical equipment development, as well as the overall mission of The Surgeon General to provide the best medical treatment consistent with field experiences.

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DD . TOP 1498M DTIC FORMAT 850

TITLE: (U) Trap, Mosquito, Light, Collapsible

FUNDING HISTORY: PY - 9K; CY - 10K; BY - 37K

PROBLEM DEFINITION: To develop an improved replacement for the Trap, Mosquito, Light (NSN 3740-00-607-0337) that is collapsible for storage, is capable of using a variety of lamps, and has an extended service life.

IMPORTANCE: The Trap, Mosquito, Light is a bulky, heavy item which is part of the TOE of the Preventive Medicine Detachment, Team LA, Entomology Services (TOE 8-620H0LA). It is an important instrument for surveillance of medically important insects in areas of static troop deployment where surveys are continued for prolonged lengths of time. This trap will provide long-term information on the control efforts of an IPM program.

APPROACH: A new collapsible, AC powered light trap will be fabricated in-house. The primary objective is to produce a durable trap that can be easily disassembled and collapsed for storage and shipment

ACHIEVEMENTS: Initial prototyptes have been constructed.

RELATIONSHIP TO CORE PROGRAM: Project involves development of a new replacement trap for one currently used by field medical units.

UNCLASSIFIED

RETRIEVAL TERMS ASSIGNED BY DTIC (U) AEROSOL GENERATORS; (U) DISEASE VECTORS; (U) CULICIDAE; (U) WARFARE; (U) UNITED STATES; (U) PREVENTIVE MEDICINE; (U) INSECT CONTROL;

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TITLE: (U) Aerosol Generator, ULV, Skid-Mounted

FUNDING HISTORY: PY - 10K; CY - 46K; BY - 11K

PROBLEM DEFINITION: To evaluate and recommend for adoption into TOE's an ULV aerosol generator to replace current cold fog generators.

IMPORTANCE: Since 1960 commercial pest control has used the environmentally acceptable methods of ULV aerosol generator for adult mosquito control. In this area, the military has not maintained state-of-the-art. Adoption of these generators will provide the TOE units the capabilities to control adult mosquitoes using ultra-low volume techniques.

APPROACH: Commercial units of a high-air volume, low-air pressure design will be evaluated both functionally and operationally. Results will be used as the basis for procurement of aerosol generators.

ACHIEVEMENTS: All DT and OT in these units have been successfully completed. Project has met all criteria for type classification.

RELATIONSHIP TO CORE PROGRAM: Project involves modernization of existing military pest control equipment to give field medical units modern, effective equipment.

MANUSCRIPT: Aerosol Generator, ULV, Skid Mounted, Kardatzke, Dr. James T., and Dr. James H. Nelson. Technical Report 8009.

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TITLE: Pesticide Dispersal Unit, Portable, Backpack

FUNDING HISTORY: PY - 20K; CY - 4K; BY - 4K

PROBLEM DEFINITION: To evaluate and recommend adoption of a commercial motorized backpack unit that is capable of dispensing both liquid and solid pesticide formulations.

IMPORTANCE: An operational need exists for a motorized backpack unit that can dispense both liquid and solid pesticide formulations. The unit is needed to provide control during field operations in localized and remote areas where vehicular or aerial dispersal equipment cannot be used or is not readily available.

APPROACH: Available commercial backpack units will be evaluated from an engineering aspect to determine the best candidate units for operational evaluation. Selected units will be evaluated by an operational user to determine any unforeseen problems in deployment.

ACHIEVEMENTS: The concept of the backpack sprayer/duster was successfully proven during OT I conducted in October 1979. System is logistically supportable using existing logistic components.

RELATIONSHIP TO CORE PROGRAM: Project involves evaluation of commercial items for adoption as military standard items in medical TOE. Project is part of core program for pest control equipment development.

MANUSCRIPT: Engineering Evaluation of Commercial Backpack Sprayer/Dusters, Kardatzke, Dr. James T., Gula, Philip R., and Dr. James H. Nelson. For publication in Mosquito News.

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TITLE: (U) Pesticide Dispersal Unit, Liquid, Helicopter Slung

FUNDING HISTORY: PY - 12K; CY - 56K; BY - 42K

PROBLEM DEFINITION: To adapt a commercial aerial sprayer to meet the needs of the military for a slung unit that is capable of liquid dispersal in both high volume and ultra-low volume modes.

IMPORTANCE: Medical personnel engaged in field operations need the capacity for aerial dispersal of liquid pesticide formulations. The unit is needed to ensure rapid treatment of large areas inaccessible by ground equipment but too small for efficient use of larger aerial dispersal equipment. Current standard item represents a health and safety hazard to the helicopter crew since unit is internally mounted instead of slung.

APPROACH: To adapt a readily available commercial sprayer for military use. The commercial sprayer will be modified to include a ULV Beecomist nozzle system and a means for effective control of unit functions from the interior of the helicopter. Unit will be completely independent of the helicopter and easily jettisonable in an emergency.

ACHIEVEMENTS: Deficiencies noted during OT II (FY 80) have been corrected. Equipment is presently ready for OT IIa scheduled during FY 82. Equipment design has been modified to increase the capability to apply ULV pesticides. Extensive modifications had been accomplished which have improved the reliability of the electrical system on the sprayer.

RELATIONSHIP TO CORE PROGRAM: Project involves evaluation and modification of a commercial unit. Item will replace a current obsolete standard item which is a part of the TOE of the Preventive Medicine Detachment, Team LA. Project is part of the pest control equipment program.

MANUSCRIPT: Helicopter-slung Insecticide Dispersal Equipment, Kardatzke, Dr. James T., Nelson, Dr. James H., Conway, William H., and William H. Reams. Oral presentation at AMCA Annual Meeting, 15-18 March 1981, San Antonio, TX.

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DTIC FORMAT 850

TITLE: (U) X-Ray Film Processor, Dental, Portable, Field

FUNDING HISTORY: PY - 25K; CY - 8K; BY - 2K

PROBLEM DEFINITION: To identify a suitable X-Ray Film Processing Portable Field unit to support a low capacity X-ray unit.

IMPORTANCE: Portable wet X-ray film processors and accessories are not suitable for use by small dental units outside of field type hospitals based on excessive weight, complexity, and requirements for electrical power, water, and processing chemicals. The need is acute and critical for dental units/sections to complement the low capacity X-ray apparatus recently approved for limited procurement.

APPROACH: Search and obtain an industrially developed functional device that can be adapted to meet the established characteristics.

ACHIEVEMENTS: Operational Testing I (OT I) was initiated on 16 July 1979 and completed on 26 October 1979. Results were good with only minor design changes. Prototype was modified to correct OT I deficiencies and subjected to Development Testing II (DT II). DT II was successfully concluded on 3 March 1980. Maintenance evaluation was accomplished and concluded on 3 March 1981. Modified commercial Operations and Mantenance Manual was forwarded to USAMMA for review and concurrence.

RELATIONSHIP TO CORE PROGRAM: This program is directly related to the Laboratory's mission to develop field medical materiel.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) CLINICAL MEDICINE ; (U) BAGS ; (U) FUNCTIONAL ANALYSIS

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TITLE: (U) Bag, Aidman's, Redesign of

FUNDING HISTORY: PY - 16K; CY - 47K; BY - 8K

PROBLEM DEFINITION: The current case, Medical Instrument and Supply Set (NSN 6545-00-912-9870) has been found inadequate. Because of the small size and configuration of the bag, the aidman is severely limited in his treatment capability in combat. The need exists for a larger bag, which provides easier access to its contents.

IMPORTANCE: The ability of the combat medical corpsman to provide prompt and effective treatment to soldiers in the field will be greatly enhanced by providing him with an aid bag containing a wider variety of medications, dressings, and instruments, which are easily accessible.

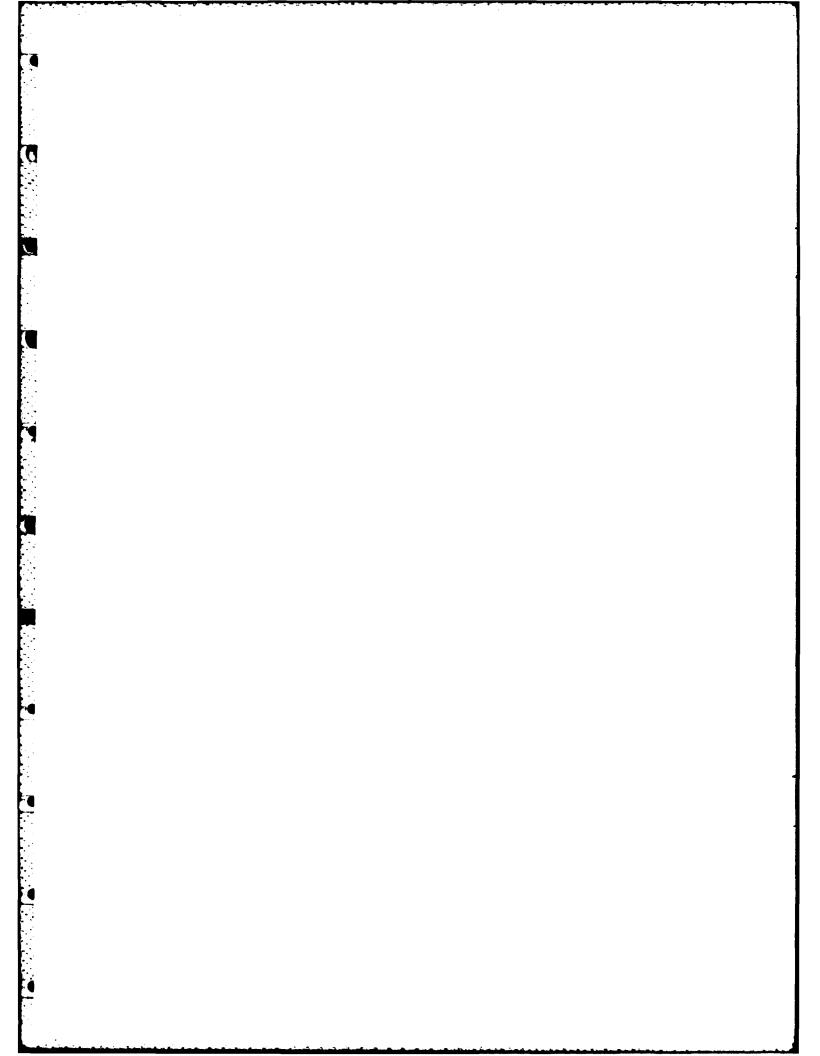
APPROACH: Various bags and cases which are already in the supply system were investigated. The bags most suitable for the projected need of the platoon aidman were either too small (M-3), overly compartmented (M-16), or without organizing compartments (M-5).

ACHIEVEMENTS: The prototype design and the test data obtained thus far were submitted to study by a joint working group (JWG). While approving the concept, the JWG mandated additional testing and raised several issues concerning the need for waterproof chemicalproof fabrics and the ability to fit this equipment into the assemblage of equipment already being carried by the aidman. These issues are under study as of this report date, and additional test prototypes of the original design are being fabricated.

RELATIONSHIP TO CORE PROGRAM: The design and development of a more efficient aid bag for use by the platoon aidman is consonant with the mission of The Surgeon General to provide the best in medical treatment for the soldier in the field.

MANUSCRIPT: A New Aid Bag for the Combat Medical Corpsman; O'Connor, Richard J., Brewer, Robert R., and Luther T. Geasey, Jr. Technical Report 8103, Feb 81.

ENVIRONMENTAL QUALITY TECHNOLOGY



UNCLASSIFIED

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TITLE: Evaluation of Chemical Addition for Enhancement of Secondary Treatment and Ancillary Nutrient Removal

FUNDING HISTORY: PY - 0; CY - 294; BY - 0

PROBLEM DEFINITION: This research addresses the use of the rotating biological contactor (RBC) to upgrade Army trickling filters to meet wastewater discharge standards. The effect of low-level lime addition for phosphorus removal will be studied to determine whether less RBC surface area is required for carbon oxidation. The distribution of populations of heterotrophic and autotrophic organisms will be correlated with organic loading rates and removal efficiencies.

IMPORTANCE: The RBC is in use at a number of installations to help the Army achieve mandated discharge criteria. Some installations have encountered problems in achieving nutrient removal.

APPROACH: Three RBC units are operated in parallel as four three-stage treatment systems. A control unit is operated along with three experimental units so that comparisons of data are more accurate.

ACHIEVEMENTS: Work completed; final report in preparation. The primary effect of low-level lime addition is to reduce the organic loading, thereby preventing over-loading of the first stage of the RBC, and making more surface area of subsequent stages available for nitrification.

RELATIONSHIP TO CORE PROGRAM: This research is part of the Army's effort in water pollution hazard assessment, source reduction, control, and treatment technology.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) TOXICOLOGY ; (U) TOXICITY ; (U) STATICS ; (U) MILITARY FACILITIES ; (U) ARMY ; (U) AQUATIC ORGANISMS : (U) *AMMUNITION : (U) *WATER POLLUTION : (U)

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TITLE: Screening of Military Chemicals for Toxicity of Aquatic Organisms

FUNDING HISTORY: PY - 63K; CY - 124K; BY - 150K

PROBLEM DEFINITION: This project is designed to provide data on the toxicity of munitions-related materials to aquatic organisms. Short- and longer-term tests with several species of fish and an invertebrate will be conducted under static and dynamic water flow conditions. Effects on mortality and, in certain tests, growth and reproduction will be recorded.

IMPORTANCE: Pollution control facilities at Army ammunition plants are currently being upgraded. The type and extent of treatment required for aqueous effluents will depend greatly on the toxicity of the effluent components to aquatic life. Generation of this toxicity information will aid in assessing the environmental hazard posed by the munitions-related materials found in these effluents.

APPROACH: Preliminary screening tests include static, acute tests with fish and an invertebrate. These are followed by dynamic (flow-through) acute tests. Effects on the sensitive life stages of fish will be evaluated using a 35 day embryo-larval test. Survival, growth, and reproduction of an invertebrate will be determined in a full life cycle test.

ACHIEVEMENTS: Static, acute screening tests have been completed with four species of fish and an invertebrate. Materials tested included 1,3-dinitrobenzene, 1,3,5-trinitrobenzene, and 3,5-dinitroaniline. Of these, 1,3,5-trinitrobenzene was by far the most toxic, with 96-hour LC50's of 1 mg/L or less. Longer term flow-through tests with selected fish species have also been completed and have provided useful information on the level and kinds of effects of these compounds.

RELATIONSHIP TO CORE PROGRAM: This work is based on a request by the US Army Materiel Command for information relating to the design of waste treatment facilities. Measurements of the toxicity to aquatic organisms of various components of a waste effluent are an important part of the data base required for the design of proper waste treatment techniques.

UNCLASSIFIED

RETRIEVAL TERMS ASSIGNED BY DTIC (U) CHARCOAL; (U) BIDASSAY; (U) ARMY; (U) AQUATIC ORGANISMS; (U) WATER TREATMENT; (U) WATER; (U) WASTES; (U) WASTE TREATMENT; (U) SOLIDS; (U)

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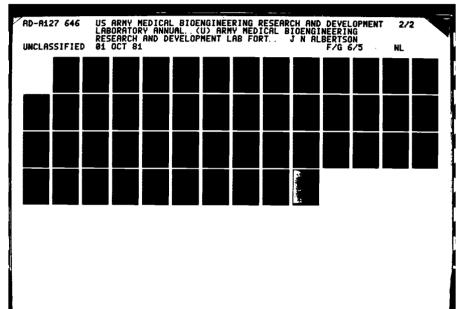
PROGRESS: (U) 8010 - 8109. FIELD TESTING OF THE FLOW-THROUGH SERIES OF CARBON COLUMNS AT FORT EUSTIS, VA. IS OVER. THIS SYSTEM OPERATED AT 0.2 GPM. WILL RELIABLY REMOVE MALATHION BAYGON, DIAZINON AND DIMETHOATE FROM WATER. DURSBAN AND 2,4-D ESTER ARE REMOVED WITH DIFFICULTY AND CHLORDANE IS ONLY PARTIALLY REMOVED. BREAKTHROUGH DATA IS AVAILABLE FOR SOME OF THESE SUBSTANCES AND A FINAL REPORT IS IN PREPARATION. CONCURRENT WITH THIS WORK, WE BEGAN THE EVALUATION OF A NEW CARBON FILTRATION SYSTEM, THE CARBULATOR SUPERSCRIPT R. ALL TESTS WITH THIS SYSTEM HAVE BEEN SUCCESSFUL.

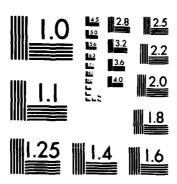
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PROCESSING DATE: 06 JAN 82

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OBJECTIVE: (U) TO EVALUATE THE USE OF FILTRATION/ADSORPTION TECHNIQUES FOR TREATMENT OF WASTES GENERATED BY ARMY INSTALLATION PEST CONTROL FACILITIES.

APPROACH: (U) THE FILTRATION/ADSORPTION SYSTEM WILL BE TAKEN TO FORT EUSTIC, VA AND SET UP WITHIN THE NEW FORT EUSTIS PEST CONTROL FACILITY FOR ON-SITE TESTING. WASTEWATER FROM THE FORT EUSTIS FACILITY WILL BE COLLECTED, STORED AND TREATED BY THE CARBON ADSORPTION SYSTEM. EFFLUENT SAMPLES FROM EACH CARBON COLUMN WILL BE COLLECTED ON-SITE AND ANALYZED AT FORT DETRICK'S ENVIRONMENTAL PROTECTION RESEARCH DIVISION LABORATORY. FROM THIS DATA WE WILL EVALUATE THE PERFORMANCE OF THE ABSORPTION SYSTEM.

PROGRESS: (U) 8010 - 8109. FIELD TESTING OF THE FLOW-THROUGH SERIES OF CARBON COLUMNS AT FORT EUSTIS, VA, IS OVER. THIS SYSTEM OPERATED AT 0.2 GPM, WILL RELIABLY REMOVE MALATHION BAYGON, DIAZINON AND DIMETHOATE FROM WATER. DURSBAN AND 2,4-D ESTER ARE REMOVED WITH DIFFICULTY AND CHLORDANE IS ONLY PARTIALLY REMOVED. BREAKTHROUGH DATA IS AVAILABLE FOR SOME OF THESE SUBSTANCES AND A FINAL REPORT IS IN PREPARATION. CONCURRENT WITH THIS WORK, WE BEGAN THE EVALUATION OF A NEW CARBON FILTRATION SYSTEM, THE CARBULATOR SUPERSCRIPT R. ALL TESTS WITH THIS SYSTEM HAVE BEEN SUCCESSFUL.

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DTIC FORMAT 850

PROCESSING DATE: 06 JAN 82

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TITLE: Evaluation of Filtration Techniques for Disposal of Operational Wastes from Army Pest Management Programs

FUNDING HISTORY: PY - 34; CY - 86; BY - 10K

PROBLEM DEFINITION: To evaluate the use of carbon adsorption techniques for treatment of wastes generated by Army installation pest control facilities.

IMPORTANCE: The US Army operates pest control facilities at its installations throughout the country. Federal law places the responsibility for safe disposal of pesticides and pesticide wastes on the user - DA. As a result, the Army is responsible for the safe disposal of the pesticide waste it generates.

APPROACH: The filtration/adsorption system was taken to Ft. Eustis, VA and set up within the new Ft. Eustis Pest Control Facility for on-site testing. Wastewater from the Ft. Eustis Facilitary was collected, stored and treated by the carbon adsorption system. Effluent samples from each carbon column were collected on-site and analyzed at Ft. Detrick's Environmental Protection Research Division Laboratory. From these data we will evaluate the performance of the adsorption system.

ACHIEVEMENTS: Laboratory tests of the carbon filtration system are complete. A recipe wastewater containing diazinon, dursban, malathion, baygon and chlordane at a level of 1200 mg/L total pesticide has been tested. Five-hundred gallons of such a wastewater may be treated and the effluent will show no diazinon, dursban, malathion, or baygon (below 1 ppm). Chlordane was found in the effluent at concentration near that of the input concentration. Aeration of the wastewater to remove volatile chlorinated solvents from wastewater did not improve performance of the adsorption system. Preliminary leaching tests of spent carbon indicate a very slow rate of pesticide leaching at pH 4.0. The wastewater being generated at Ft. Eustis shows pesticide concentrations much lower than expected. The first test at Ft. Eustis showed removal of all materials except chlordane. The input water contained 16 ppm chlordane while effluent showed 0.2 ppm. Other pesticides present in the input water were kelthane (42 ppm) and dursban (1 ppm); these were absent in the effluent. During the second field test, the Ft. Eustis input wastewater contained less than 0.5 ppm of any of the expected pesticides.

RELATIONSHIP TO CORE PROGRAM: This research is a part of the Army's evaluation of health and environmental consequences of the disposal of hazardous wastes and pesticides generated by military activities.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) ARMY ; (U) CONSTRUCTION; (U) HEALTH PHYSICS ; (U) LAW

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TITLE: Development and Evaluation of Criteria for Advanced Wastewater Treatment Processes at Military Installations

FUNDING HISTORY: PY - 117; CY - 294; BY - 0

PROBLEM DEFINITION: To evaluate phosphorus removal techniques and processing of the resultant chemically treated effluent and chemical sludges produced. The applicability of combining carbon and nitrogen oxidation processes will be evaluated to determine its impact on upgrading US Army wastewater facilities.

IMPORTANCE: The importance of this work lies in optimizing wastewater treatment processes through combining chemical/physical treatment technologies with biological processes. The goal is to improve the overall plant efficiency with minimal construction. Combining low-level lime treatment processes for phosphours removal followed by biological recarbonation not only allows for phosphours concentrations to meet effluent limitations, but also enhances nitrification. This research is highly-relevant to current Army problems of compliance with discharge limitations at installations. It may permit compliance by upgrading existing facilities.

APPROACH: Pilot-scale studies will be conducted on selected advanced wastewater treatment processes and problems. Emphasis will be placed on upgrading existing facilities, rather than attempting to develop processes and procedures for totally new treatment plants. The goal will be to satisfy NPDES permit limitations for designated pollutants, as opposed to attempting to obtain design criteria for extremely low pollutant levels. Laboratory and bench-scale studies will be conducted in support of pilot-scale operations.

ACHIEVEMENTS: Three technical reports have been published: (1) "Phosphorus Removal in a Pilot Scale Trickling Filter System by Low-Level Lime Addition to Raw Wastewater," R.D. Miller, R.S. Ryczak, and A. Ostrofsky. Technical Report 7901, AD A065041. (2) "Rotating Biological Contactor Process for Secondary Treatment and Nitrification Fcllowing a Trickling Filter," R.D. Miller, C.I. Noss, A. Ostrofsky, and R.S. Ryczak. Technical Report 7905, AD A074172. (3) "Rotating Biological Contactor Process for Secondary Treatment and Recarbonation Following Low-Level Lime Addition for Phosphorus Removal," C.I. Noss and R.D. Miller. Technical Report 8007, AD A084944.

RELATIONSHIP TO CORE PROGRAM: An agreement between USAMBRDL and USACERL has been established such that existing equipment and expertise and be used effectively in solving Army waste treatment problems.

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DIGESTION.

APPROACH: (U) THREE FERMENTORS WILL BE RUN IN PARALLEL. ONE FERMENTOR WILL BE A CONTROL UNIT BEING FED NORMAL PRIMARY SLUDGE. ONE FERMENTOR WILL BE FED A SLUDGE RESULTING FROM COMMERCIAL LIME ADDITION (MAGNESIUM IMPURITIES) WHILE THE THIRD FERMENTOR WILL BE FED SLUDGE RESULTING FROM REAGENT GRADE LIME (NO MAGNESIUM). PROCESS PARAMETERS, PH, GAS, SOLIDS DESTRUCTION, COD DESTRUCTION, CH% AND NH SULL BE MONITORED. AFTER THE INHIBITION OCCURS, SODIUM AND/OR POTASSIUM WILL BE USED AS AN ANTAGONIST.

PROGRESS: (U) 8010 - 8109. WORK COMPLETED; FINAL REPORT IN PREPARATION.

PROCESSING DATE: 30 NOV 81

- FORM 1498M

DTIC FORMAT 850

PAGE

7

TITLE: Anaerobic Digestion of Lime Sludge

FUNDING HISTORY: PY - OK; CY - OK; BY - OK

PROBLEM DEFINITION: The purpose of this project is to verify the cause of inhibition experienced in the lime sludge digestors as light metal cation toxicity and to determine the concentration of calcium and/or magnesium required to cause the inhibition. The second half of the study will investigate the possible use of sodium and/or potassium as an antagonist to reduce or eliminate the inhibitory effects of calcium and/or magesium on the anaerobic digestion process.

IMPORTANCE: The importance of this work lies in the optimization of the anaerobic digestion of lime sludges. If the inhibition process occurring in lime digestors can be decreased, any Army wastewater treatment plant using a lime coagulation and sedimentation process can use existing anaerobic digestors, eliminating the need to construct new facilities for sludge digestion.

APPROACH: The fermentors will be run in parallel. One fermentor will be a control unit being fed normal primary sludge. One fermentor will be fed a sludge resulting from commercial lime addition (magnesium impurities) while the third fermentor will be fed sludge resulting from reagent grade lime (no magnesium). Process parameters, pH, gas, solids destruction, COD destruction, CH₄ and NH₃ will be monitored. After the inhibition occurs, sodium and/or potassium will be used as an antagonist.

ACHIEVEMENTS: A technical report is being prepared on the first year's work.

RELATIONSHIP TO CORE PROGRAM: This research is part of the Army's efforts in water pollution source reduction, control, and treatment technology.

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 23. TECHNICAL OBJECTIVE.® 24 APPROACH, 25. PROGRESS (Furnish Individual peragraphs identified by number. Procede test of each with Security Closelfication Code.)
- 23. (U) To evaluate the applicability of wastewater treatment processes for degradation of waste pesticides and rinsates generated by Army pest control facilities. Rederal legislation has established that the disposal of pesticide wastes be the responsibility of the user. As a result, many Army pest control facilities do not have the capability to meet the present storage or disposal requirements. The variety of pesticides and pesticide wastes generated by the Army make this a unique effort in waste disposal.
- 24. (U) Initial work will involve laboratory studies to determine pesticide concentrations which can be recovered from sewage effluents and sludges. Development and modification of extraction procedures are necessary to recover the seeded pesticide and possible degradation products. Pure bacterial cultures and organisms from waste treatment processes will be used in batch degradation studies, followed by the operation of pilot-scale processes. The goal will be to demonstrate the biodegradability, inertness, or accumulation of pesticides in the wastewater treatment processes.
- 25. (U) 8010 8109. Study terminated due to loss of funding.

DD, 1011 1498

TITLE: Evaluation of Wastewater Treatment Processes for Disposal of Army Generated Pesticide Wastes

FUNDING HISTORY: PY - 12; CY - 75; BY - 0

PROBLEM DEFINITION: One objective is to determine the fate of pesticide compounds in sewage treatment processes in common use at military installations. Also, the effect of these compounds on the performance of an experimental trickling filter unit will be assessed.

IMPORTANCE: The Federal Insecticide, Fungicide and Rodenticide Act and the Resource Conservation and Recovery Act apply, respectively, to the use and later discharge of pesticidal substances by the Army. Such substances may reach sewage treatment plants through either intentional discharge or surface runoff. Thus, it is to the advantage of the Army to investigate the fate of these compounds in treatment processes and their possible toxic effect upon these processes.

APPROACH: Seven pesticide compounds, chosen for their widespread use at military installations, will be studied. These are baygon, cygon, chlordane, diazinon, dursban, malathion, and ronnel. Bench-scale settling experiments with and without flocculant will be performed using untreated wastewater and trickling filter effluent from local sources. The persistence of each compound during settling and its partition into aqueous and sediment phases will be determined. Pesticide persistence in bench-scale anaerobic sludge digestion and trickling filter processes will be studied. Pesticide effect on trickling filter performance will be assessed by measuring reductions in important wastewater parameters, in the presence and absence of the pesticides.

ACHIEVEMENTS: A research plan and research protocol were prepared for this work unit.

RELATIONSHIP TO CORE PROGRAM: This research is part of the Army's evaluation of the environmental consequences of the use and dischalse of pesticidal substances at military installations. Studies in this area have been requested by TRADOC and have included the development of an activated carbon system for adsorption of pesticides from contaminated wash waters.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) BIODETERIORATION; (U) ADSORPTION; (U) HYDROLYSIS; (U) DEGRADATION; (U) CHEMICAL REACTIONS; (U) CHEMICAL COMPOUNDS; (U) WORK; (U) TRANSFORMATIONS

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OBJECTIVE: (U) THE OBJECTIVE IS TO DETERMINE THE CHEMICAL DEGRADATION AND BIODEGRADATION RATE CONSTANTS FOR USE IN A MATHEMATICAL MODEL FOR PREDICTION OF THE ENVIRONMENTAL FATE OF CHEMICAL POLLUTANTS OF IMPORTANCE TO ARMY MUNITIONS PRODUCTION.

APPROACH: (U) THE RATE OF CHEMICAL DEGRADATION OF SELECTED COMPOUNDS VIA PHOTOLYTIC, HYDROLYTIC AND OXIDATIVE PATHWAYS WILL BE DETERMINED. THE RATE OF MICROBIAL DEGRADATION WILL BE DETERMINED. THE RATE OF MICROBIAL DEGRADATION WILL BE DETERMINED BY USING MICRODRGANISMS ENDOGENOUS TO THE SITE OF POLLUTION. IDENTIFICATION OF TRANSFORMATION PRODUCTS WILL BE ATTEMPTED. ADSORPTION TO SEDIMENTS AND BIOSORPTION TO SELECTED MICRODRGANISMS WILL BE MEASURED.

PROGRESS: (U) 8010 - 8109. 1,3-DINITROBENZENE; 1,3,5-TRINITROBENZENE AND 3,5-DINITROANILINE WERE SYNTHESIZED, PURIFIED AND METHOD DEVELOPED FOR THEIR ANALYSIS. THE TWO FORMER COMPOUNDS ARE VERY SLOW TO PHOTODEGRADE IN WATER AND ALL THREE ARE STABLE TO HYDROLYSIS. A NEW METHOD TO MEASURE THE VOLATILITY OF THESE SUBSTANCES WAS DEVELOPED AND VOLATILITY OF 1,3 DINITROBENZENE, 1,3,5-TRINITROBENZENE, AND 3,5-DINITROANILINE WAS DETERMINED. BIODEGRADATION STUDIES FOR 1,3-DINITROBENZENE, 1,3,5-TRINITROBENZENE, AND 3,5-DINITROANILINE HAVE BEEN COMPLETED AND DOCUMENTATION IS BEGINNING.

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DTIC FORMAT 850

PROCESSING DATE: 30 NOV 81

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PAGE

TITLE: Chemical Fate of Military Compounds

FUNDING HISTORY: PY - 0; CY - 158K; BY - 41K

PROBLEM DEFINITION: The objective is to determine the chemical degradation and biodegradation rate constants for use in a mathematical model for prediction of the environmental fate of chemical pollutants of importance to Army munitions production.

IMPORTANCE: Like other chemicals, the wastes resulting from the munitions manufacturing and loading processes could be subjected to federal discharge regulations. TNT (2,4,6-trinitrotoluene) and RDX (1,2,5-trinitrohexdydro 1,3,5-triazine) are manufactured at Army munitions facilities and are discharged with associated waste chemicals without significant treatment. Since wastewaters from munitions manufacturing facilities are released to the environment and since the chemical compounds contained in the wastes have the potential to affect health, it is important to define the overall environmental fate of these chemicals.

APPROACH: The rate of chemical degradation of selected compounds via photolytic, hydrolytic and oxidative pathways will be determined. The rate of microbial degradation will be determined by using microorganisms endogenous to the site of pollution. Identification of transformation products will be attempted. Adsorption to sediments and biosorption to selected microorganisms will be measured.

ACHIEVEMENTS: 1,3-Dinitrobenzene; 1,3,5-trinitrobenzene and 3,5-dinitroaniline were synthesized, purified and methods developed for their analysis. The two former compounds are very slow to photodegrade in water and all three are stable to hydrolysis. A new method to measure the volatility of these substances was developed and volatility of 1,3-dinitrobenzene was determined. A culture was developed which would use 1,3-dinitrobenzene as a sole carbon source, and the second order rate constant for its biodegradation was determined. 1,3,5-trinitrobenzene and 3,5-dinitroaniline would not act as sole carbon sources and appeared to be cometabolized in the presence of exogenous methabolizable nutrients. One product was recovered after the microbiological transformation of 1,3,5-trinitrobenzene and at least resulted from the transformation of the aniline compound.

RELATIONSHIP TO CORE PROGRAM: This research is a part of the Army's evaluation of the health and environmental consequences of munitions manufacture carried out by military activities.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) AQUATIC ORGANISMS; (U) PH'__COCHEMICAL PROPERTIES; (U)
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TITLE: (U) Environmental Fate Studies of 2,4,6-Trichloroaniline

FUNDING HISTORY: PY - 0; CY - 163; BY - 215

PROBLEM DEFINITION: The US Army Toxic and Hazardous Materials Agency had reported the occurrence of 2,4,6-trichloroaniline (TCA) in sediments of a small canal leading to the Gunpowder River, and in the river itself, in the vicinity of Aberdeen Proving Ground (APG). The present study was intended to provide basic information useful in predicting TCA's environmental fate.

IMPORTANCE: TCA was believed to be a major sediment contaminant resulting from past military industrial operations in the Edgewood Arsenal area of APG. As such, information was needed to permit prediction of TCA's impact on the ecology and on the health of humans exposed to TCA through the food chain.

APPROACH: Laboratory tests were to be carried out on TCA to determine physical-chemical properties, subh as photodegradability, solubility, volatility, octanol-water partition coefficient and soil-water equilibria.

ACHIEVEMENTS: TCA solubility in water (mg/L, T^{O} C) is: 22,10; 32,19; 46,32. UV maxima at 245 and 306 um. Sunlight photolysis gives four or more phenazine derivatives; conversion of 20 mg/L is complete in 48 hours of exposure (July). K_{OW} = 2400 by HPLC; 3500 by direct measurement. Sediments contained no TCA, but did contain a TCA precursor (a urea) that decomposed to TCA and 2,4,6-trichlorophenyl isocyanate at the injection port of a GC column.

RELATIONSHIP TO CORE PROGRAM: Environmental fate studies are currently being conducted both intra- and extra-murally at USAMBRDL for both hazardous compounds and munitions discharges.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) FILMS ;(U) FIRE FIGHTING ;(U) FDAM ;(U) LIQUIDS ;(U) NAVY ;(U) REVERSE DSMOSIS ;(U) SCHOOLS ;(U) SITES ;(U) ULTRAFILTRATION ;(U) WASTE WATER

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DTIC FORMAT 850

PAGE 10

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TITLE: UF-RO System for AFFF Recovery: Test and Evaluation

FUNDING HISTORY: PY - 0; CY - 14; BY - 0

PROBLEM DEFINITION: The purpose of this effort is to fabricate an ultrafiltration - reverse osmosis (UF-RO) system to be tested for removal and recovery of aqueous film-forming foam (AFFF) from firefighting wastewaters.

IMPORTANCE: The US Navy operates firefighting schools for the training of personnel from all uniform services. AFFF in the wastewaters interferes with operation of treatment plants, and is toxic to marine life.

APPROACH: The pilot UF-RO system will be fabricated from existing units at Fort Detrick, then tested and evaluated at a selected navy site for its technical and economical feasibilities for recovery of AFFF.

ACHIEVEMENTS: Equipment has been fabricated. Testing by navy will begin at San Diego in 1982.

RELATIONSHIP TO CORE PROGRAM: This research is part of the Army's effort in water pollution hazard assessment, source reduction, control, and treatment technology.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) AMMUNITION ; (U) ARMY OPERATIONS ; (U) BIODETERIORATION ; (U) PHYSICAL CHEMISTRY; (U) POLLUTANTS ; (U) SEDIMENTS ;

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DTIC FORMAT 850

PAGE

TITLE: (U) Environmental Fate of 2,4,6-Trichloroaniline: Microbial Interactions

FUNDING HISTORY: PY - 0; CY - 18; BY - 18

PROBLEM DEFINITION: Wastes from manufacturing and laundering operations involving the chemical 2,4,6-trichloroaniline (TCA) were discharged into the Canal Creek at the Aberdeen Proving Ground from World War II until the 1960s. Chemical analysis of river sediments from the Gunpowder Neck Region of the Aberdeen Proving Ground have led to estimates that from 15 to 20 square miles of the area are contaminated with the pollutant.

IMPORTANCE: Should it be necessary to perform a risk assessment for TCA, it is the Army's responsibility to provide the data base for that assessment. Toward that end, microbial interactions with the compound are being studied as an integral part of Environmental Fate research at USAMBRDL.

APPROACH: The susceptibility of TCA to biodegradation will be determined by aerobic and anaerobic screening procedures using microorganisms indigenous to the pollution site. Should biodegradation take place, attempts will be made to utilize the compound as a growth substrate and to measure the rate of its microbial degradation. Bioadsorption studies will be conducted with stock cultures of environmentally significant microorganism.

ACHIEVEMENTS: Preliminary results of aerobic screening for TCA biodegradation indicate that the compound is degraded by microbial action. Methodology for anaerobic screening has been assembled and is being tested. Bioadsorption studies are complete and indicate that bioadsorption should not be a major factor in the environmental fate of the compound.

RELATIONSHIP TO CORE PROGRAM: Environmental fate studies are currently being conducted both intra- and extra-murally at USAMBRDL for both hazardous compounds and munitions discharges.

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TITLE: (U) Refrigerator, Medical, Field

FUNDING HISTORY: PY - 11K; CY - 31K; BY - 28K

PROBLEM DEFINITION: The biological refrigerator currently in the inventory (NSN 4110-00-707-2550) is said to be no longer supportable, primarily due to high acquisition cost.

IMPORTANCE: A refrigerator for the storage of perishable medical supplies is a necessity for field military units. The special requirements brought about by the need to store such things as whole blood and the rugged operating environment eliminate a great many commercially available units from consideration.

APPROACH: To canvas the commercial market for a machine that meets the required performance characteristics and which can be ruggedized to meet environmental and handling requirements. At the same time, consideration is to be given to reengineering of the current design to modernize it and make it more easily and cheaply procurable.

ACHIEVEMENTS: Specimens of two potential commercial units were procured and evaluated. Also procured a full drawing set for the old military model and gave consideration to updating the design to make it supportable. Prior to making a decision on this, a reconfirmation of requirements is being conducted with the Combat Developer.

RELATIONSHIP TO CORE PROGRAM: This task is consistent with the Laboratory's mission to develop equipment specific to field medical requirements.

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TITLE: (U) Sterilizer, Surgical Instrument and Dressing

FUNDING HISTORY: PY - 14K; CY - 25K; BY - 21K

PROBLEM DEFINITION: Three small tabletop sterilizers for field use (NSN 6530-00-782-6503, 6530-00-926-4857 and 6530-00-926-2022) are of aging designs and are no longer supportable. These units serve aid stations, field dental facilities, field laboratories and the like. A need exists for a single small sterilizer, supportable in a field environment, to replace these obsolete units.

IMPORTANCE: A sterilization capability in small field medical elements such as those mentioned above is an evident necessity. The substitution of a single satisfactory item for the three separate units currently in stock will greatly improve the logistical support situation relative to this class of equipment while simultaneously allowing a move up to current technology.

APPROACH: To canvas the commercial market for an item that is suitable or can be made so by minor modification. Failing this, a new development would be undertaken.

ACHIEVEMENTS: A preliminary evaluation was conducted on one commercial electrically powered unit and the results were promising. The Combat Developer advises, however, that sterilizer requirements relative to the Battalion Aid Station are undergoing study and probable revision. Since that application is of paramount importance in selection of a design, this task is now being held in abeyance pending the outcome of that review process.

RELATIONSHIP TO CORE PROGRAM: This task falls in the realm of the Laboratory's mission to provide equipment to support the practice of medicine and dentistry in a field environment.

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TITLE: (U) Vital Signs Monitor for High Noise/Vibration Environment

FUNDING HISTORY: PY - 0; CY - 28K; BY - 44K

PROBLEM DEFINITION: The ability to quantitatively measure the vital signs of a combat casualty in the high noise, high vibration environment of a moving tactical ambulance is needed. This is particularly difficult to achieve in tracked vehicles moving across unpaved terrain, and the common methods of measuring heart rate, blood pressure, etc., are probably not adequate.

IMPORTANCE: Current scenarios for future combat predict that casualties being transported by tactical ground ambulances will spend much more time in transit. This situation mandates that treatment capabilities in these vehicles be upgraded. The ability to adequately measure vital signs of the patient is fundamental to that upgraded treatment.

APPROACH: To evaluate the efficacy of existing technology when applied to this problem and to seek new techniques where existing ones are not adequate.

ACHIEVEMENTS: Specimen instruments employing the ausculatory and oscillometric methods of blood pressure measurement have been tested in an M113 vehicle. These instruments, employing a number of different artifact rejection schemes, have all failed to perform. A specimen instrument that uses ultrasound is being obtained for test.

RELATIONSHIP TO CORE PROGRAM: This task is consistent with the mission of this Laboratory to develop field medical equipment.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) FIELD EQUIPMENT; (U) MEDICAL SERVICES; (U) MEDICAL EQUIPMENT; (U) WHOLE BODY IRRADIATION; (U) *X RAY DIAGNOSTICS; (U) FLYING SPOT SCANNERS;

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TITLE: (U) Whole Body Diagnostic X-Ray Scanner

FUNDING HISTORY: PY - 32K; CY - 69K; BY - 8K

PROBLEM DEFINITION: Currently available radiographic equipment requires high radiation exposure to obtain diagnostic quality radiographs. In addition, these systems require a large amount of support (chemicals, film, water, processors, etc.) as well as operator and patient shielding.

The technology exists which would permit diagnostic quality radiographs to be made with a reduction of the radiation exposure by a factor of 100.

IMPORTANCE: The importance of reducing patient and operator exposure to ionizing radiation is well documented. The elimination of the requirements for the ancillary support items (water, film, film processors, etc.) has a direct impact on support of field medicine.

APPROACH: A contract has been let for the development of an electronic flying spot X-ray source.

ACHIEVEMENTS: The contractor has a basic patent on an electronically scanned electron beam and pinhole collimator that should produce a flying spot of X-rays. Several models have been fabricated that do produce X-rays. Gas and heat problems have limited the beam current obtained.

RELATIONSHIP TO CORE PROGRAM: The program is directly related to the Laboratory's mission of developing field medical equipment.

UNCLASSIFIED

RETRIEVAL TERMS ASSIGNED BY DTIC (U) FIELD EQUIPMENT ;(U) COMMERCE ;(U) *SURGICAL SUPPLIES ;(U) +SINKS(PLUMBING FIXTURES):

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PAGE 2

TITLE: (U) Sink Unit, Surgical, Field, Engineering Evaluation of

FUNDING HISTORY: PY - 41K; CY - 35K; BY - 0

PROBLEM DEFINITION: Numerous complaints from field medical units have been received citing problems with the Surgical Field Sink (NSN 6545-00-935-4056). The complaints deal with heater burnout and other problems. This task was undertaken to conduct an engineering evaluation of the item and determine whether a modification or a new development is necessary to correct the deficiencies.

IMPORTANCE: These sinks are used for surgical scrubbing in forward area medical units. Their high failure rate makes logistical support difficult and jeopardizes the mission of these medical units.

APPROACH: To identify the root causes of the high failure rate through extensive testing and analysis and to determine appropriate corrective action.

ACHIEVEMENTS: A modification, which addresses the principal problems with these units, was developed and tried on 40 sink units. The results of this effort have been turned over to USAMMA for implementation at the depot level.

RELATIONSHIP TO CORE PROGRAM: This task is consistent with the Laboratory's mission of providing development engineering on field medical equipment.

UNCLASSIFIED

RETRIEVAL TERMS ASSIGNED BY DTIC (U) WORK; (U) STORAGE; (U) PHYSICAL PROPERTIES; (U) MEDICAL EQUIPMENT; (U) LIGHTWEIGHT; (U) CONTAINERS

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TITLE: (U) Protective Containers, Field, Medical Devices

FUNDING HISTORY: PY - 60K; CY - 111K; BY - 65K

PROBLEM DEFINITION: A requirement exists for a family of strong, lightweight shipping containers for fragile medical equipment issued to field medical units.

IMPORTANCE: The protection of the sensitive medical equipment is essential during loading, transportation, and unloading when being deployed in field locations. This equipment, properly protected, must be available for immediate use in patient care. Unprotected, the equipment may be damaged or misaligned requiring extensive repair or recalibration.

APPROACH: Obtain medical equipment that requires packaging. These items will be tested to determine the degree of protection required. Using this information, a family of containers will be designed to protect these and other pieces of equipment. A study will also be made to increase the capacity of the existing medical equipment field chests.

ACHIEVEMENTS: Fourteen items of field medical equipment have been obtained. These have been identified as needing immediate packaging. Seven containers that will accommodate all 14 items have been designed and fabricated.

RELATIONSHIP TO CORE PROGRAM: In order to provide adequate patient care, it is essential to provide equipment in working order to units in the field. This containerization program will also reduce the time spent packaging equipment developed by this Laboratory.

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RETRIEVAL TERMS ASSIGNED BY DTIC (U) TREATMENT; (U) PROCUREMENT; (U) PATIENTS; (U)

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TITLE: (U) Tactical Ambulance Adaptation, Feasibility Study of

FUNDING HISTORY: PY - 51K; CY - 84K; BY - 13K

PROBLEM DEFINITION: To assist the Combat Developer in determining the level of medical treatment that can practically be provided in tactical ambulances by studying items of equipment and layout of tactical vehicles for compatibility.

IMPORTANCE: The "Division 86" study, currently going on, is leaning toward expansion of the level of medical treatment in the forward area including ambulance vehicles. In view of the decision that tactical ambulances will be adaptations of combat vehicles, it becomes important to know what equipment can logically be placed in those vehicles and how well the medical personnel function with it.

APPROACH: To procure specimen tactical vehicles and equip them as medical treatment/evacuation vehicles based on guidance from the Combat Developer and medical consultants. These trial configurations will then be evaluated for functional practicability and the results transmitted for use in "Division 86" or other studies.

ACHIEVEMENTS: A stabilized litter rack for the M113 ambulance has been procured and tested at Fort Benning. This item has been approved by all cognizant AMEDD agencies for adoption and has been recommended to USATACOM for procurement as a vehicle kit.

RELATIONSHIP TO CORE PROGRAM: Development of ambulance internal configuration comes under the mission of this research area to develop field medical treatment and evacuation equipment.

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TITLE: (U) Apparatus, X-Ray, Dental, Field

FUNDING HISTORY: PY - 7K; CY - 36K; BY - 37K

PROBLEM DEFINITION: New FDA regulations preclude use of previous X-ray units in field units, necessitating investigation of new X-ray units that will meet these standards.

IMPORTANCE: Current field dental TOE units do not have an authorized/certified X-ray unit.

APPROACH: Commercial sources were searched for devices that will meet the requirements.

ACHIEVEMENTS: Radiation leakage tests were completed. Modified DT I test was also completed. Single commercial prototype was subjected to OT I test.

RELATIONSHIP TO CORE PROGRAM: This program is directly related to the Laboratory's mission to develop field medical material.

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TITLE: (U) Field Gurney

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PROBLEM DEFINITION: In a mass-casualty situation, the need to move litter patients between the dispersed elements of a field hospital or clearing station would put a severe strain on the available manpower. A conveyance is needed to reduce the number of litter bearers required per carry from four to not more than two, and preferably one.

IMPORTANCE: The intense combat predicted by current European scenarios indicates that mass-casualty situations at field hospitals will be a more common occurrence. This fact, coupled with increased use of female soldiers in roles such as litter bearer, makes it necessary that manpower required for the movement of litter patients in and around field treatment facilities be reduced to a minimum and that the physical demands made on litter bearers be lessened.

APPROACH: To develop a wheeled litter carrier, after the fashion of a hospital Gurney, that is capable of being operated over moderately rough terrain by one, or not more than two, litter bearers of unremarkable physical stature.

ACHIEVEMENTS: A test bed was constructed to evaluate various wheel configurations operating over various types of terrain. A West German wheeled litter carrier is being procured for evaluation and shows promise of meeting the requirements.

RELATIONSHIP TO CORE PROGRAM: This task is consistent with the Laboratory's mission of developing field medical equipment.

PREVENTION OF MILITARY DISEASE HAZARDS

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TITLE: (U) Integrated Pest Management - Blackflies

FUNDING HISTORY: PY - 98K; CY - 92K; BY - 40K

PROBLEM DEFINITION: To develop a program of long-term suppression of blackfly populations without adverse effects on the environment.

IMPORTANCE: Blackflies are major vectors of onchoceriasis and rank high as military nuisance pests. In areas where onchoceriasis occurs, blindness due to this filarial infection is epidemic. In areas where large populations of blackflies occur, training and marshalling areas cannot be used in presence of these pests. There currently is no effective means for control of these insects.

APPROACH: Growth regulator hormones or synthetic chemical analogues and chemical pesticides will be applied in the aquatic habitat in laboratory and field evaluations in such a manner to attach to specific substrates and with slow-release action provide long lasting control. Attention will also be directed to the use of biological control agents including pathogenic protozoa, bacteria, and microsporidia. Inspect pathogens on hand will be evaluated against blackflies. Further, naturally occurring blackfly pathogens will be collected and evaluated. Laboratory and field testing are to develop methods for manipulation, storage, and application of these agents.

ACHIEVEMENTS: Several successful field trials using a commercial agent, Bacillus thuringiensis israelensis (Bti), were conducted at Holston Army Ammunition Plant, Kingsport, TN. Trials demonstrated that Bti could be effectively used over significant lengths of a stream with duration of control of 1 week or more. Control effectiveness was found not to be disrupted by stream flow characteristics or dense vegetation. Preliminary studies with nontarget organisms indicate this control strategy will not adversely affect stream fauna. Other studies have shown that larval mortality is dose-time dependant.

RELATIONSHIP TO CORE PROGRAM: This project is the first systematic approach to providing a vector control program for management of a medically important insect. Project is in keeping with mission for research in applied military vector control.

MANUSCRIPTS: The Evaluation of <u>Bacillus thuringiensis</u> var. <u>israelensis</u> against <u>Simulium Vittatum</u> (Diptera:Simuliidae) Larvae in their Natural Habitat I, Frommer, Dr. R. L., Hembree, S. C., Nelson, Dr. J. H., Remington, M. P., ARD, and Paul H. Gibbs, EPRD. For publication in Journal of Medical Entomology.

Distribution of <u>Bacillus thuringiensis</u> var. <u>israelensis</u> in Flowing Water I, Frommer, Dr. R. L., Hembree, S. C., Nelson, Dr. J. H., Remington, M. P., ARD, and P. H. Gibbs, EPRD. For publication in Journal of Medical Entomology.

The Distribution of <u>Bacillus thuringiensis</u> var. <u>israelensis</u> in Flowing Water with Extensive Aquatic Vegetative Growth. Frommer, Dr. Robert L., Nelson, Dr. James H., Remington, M. P., ARD, and P. H. Gibbs, EPRD. For publication in Mosquito News.

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OBJECTIVE: (U) TO DETERMINE THE DURABILITY OF COMMERCIALLY AVAILABLE ULTRA-LOW VOLUME (ULV) AND POWER PESTICIDE DISPERSAL EQUIPMENT BY COMPARATIVE TYPE ENGINEERING TESTS. UNITS WILL BE USED BY MILITARY MEDICAL AND ENGINEER PERSONNEL FOR CONTROLLING MOSQUITO AND OTHER FLYING INSECTS. RESULTS WILL PROVIDE THE USER AGENCIES WITH COMPARATIVE DURABILITY DATA FOR PURCHASE THROUGH MILITARY CHANNELS.

APPROACH: (U) TO DETERMINE THE OPERATIONAL CAPABILITIES OF SKID MOUNTED AND SPECIAL PURPOSE ULV PESTICIDE DISPERSAL EQUIPMENT BY QUANTITATIVE AND QUALITATIVE METHODS. MEASURABLE QUANTITATIVE PARAMETERS INCLUDE- PARTICLE SIZE DETERMINATION AND MAINTENANCE OF DESIRED PRESSURE AND FLOW RATE. GENERAL ENGINEERING DESIGN OBSERVATIONS WILL INCLUDE- CORROSIVE EFFECT OF PESTICIDE USED DURING TESTS, VERIFICATION OF MANUFACTURERS' CLAIM OF PERFORMANCE SPECIFICATIONS, GENERAL DURABILITY DEFINITIONS AS APPLIED TO MEAN TIME BETWEEN BREAKDOWN, MAINTENANCE TIME, GAS AND OIL CONSUMPTION AND DEFINITION OF HIGH MORTALITY REPAIR PARTS.

PROGRESS: (U) 8010 - 8109. EVALUATION OF MICRO-GEN MODELS CCG-1, M-16, AND S-4 COMPLETED. EVALUATION OF BALT MODEL E-10 COMPLETED. EVALUATION OF MICRON ULVA AND MINI ULVA IS IN PROGRESS. SKID MOUNTED POWER SPRAYER WILL BE EVALUATED DURING FY82.

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TITLE: (U) Evaluation of Skid Mounted and Special Purpose Pesticide
Dispersal Equipment

FUNDING HISTORY: PY - 64K; CY - 20K; BY - 11K

<u>PROBLEM DEFINITION</u>: Continuous evaluation of the basic engineering design and durability and operational effectiveness of commercial pest control equipment.

IMPORTANCE: Yearly, new, and improved commercial items are presented to DOD as potential standard items. Most of these are suitable for DOD use. Others are unfit and should not be procured. Centralized, uniform testing of these items, on a request basis, is essential to maintain state-of-the-art technology in pest control and to keep from wasting tax dollars on unacceptable equipment.

APPROACH: At the request of other DOD agencies and developing needs of military vector control programs, conduct extensive engineering and operational evaluations of designated items. These evaluations will include items such as specification design, quality assurance testings as required by specification and procurement, and individual item evaluation.

ACHIEVEMENTS: Evaluations of the Micro-Gen CCG-1, M-16, and Bolt E-10 resulted in information that was used to justify bringing these units of equipment into the federal supply system. Two portable ULV sprayers, Micron ULVA and Mini ULVA, were evaluated for durability and acceptance. Problems encountered related to unacceptable pesticide exposure by operating personnel and a great amount of variation in droplet sizes produced by these sprayers.

RELATIONSHIP TO CORE PROGRAM: Project involves continuous evaluation of commercially available pesticide dispersal equipment. Project provides a technology base for pest control equipment evaluation and development.

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PROCESSING DATE: 31 MAY 82

TITLE: (U) Pesticide Dispersal Evaluation Set

FUNDING HISTORY: PY - 18K; CY - 34K; BY - 11K

PROBLEM DEFINITION: The development of instrumentation that can accurately measure droplet size distribution in pesticide aerosols, thus providing precise calibration for pesticide dispersal units.

IMPORTANCE: Accurate calibration of dispersal equipment is essential for the effective and economical usage of ULV pesticide formulations to provide protection for the soldier from disease vectors and pest arthropods. The dissemination of droplets that are too large for effective control are capable of adverse environmental effects.

APPROACH: An optical imaging aerosol droplet sizing spectrometer has been secured and has been calibrated. A ground aspirator which produces a constant speed airflow past the sampling region of the spectrometer has been secured. The aspirator will provide isokinetic conditions at the sampling region and will also enable the data processing system of the spectrometer to provide aerosol concentration information. Various nonvolatile droplet aerosols will be dispersed, and information on their size distribution and propagation will be gathered.

Additional experiments are planned in which the results of the aerosol spectrometer are compared with other droplet sizing techniques (e.g., slidewave, settling, hot wire sampler).

ACHIEVEMENTS: The PMS optical imaging droplet spectrometer (OIDS) was installed in the Laboratory. A series of tests were conducted to test correlation of OIDS with current slidewave methodology. After refinement by the manufacturer, an initial correlation coefficient was determined. The OIDS was also successfully operated using field power sources, thus demonstrating a potential for field utilization. A comparison of a hot-wire droplet measuring device and the OIDS was completed. Results indicated close correlations with water, but not with mineral oil. A contract with KLD Associates is planned which will look at some of the phenomenon associated with measuring droplets using a hot wire. Calibration curves will be established for insecticides, and another comparison with the OIDS will be made.

RELATIONSHIP TO CORE PROGRAM: An item of medical surveillance equipment which will enable the TOE entomology service units to ensure application of proper droplet sizes by their ULV dispersal equipment. Program is related to the core program in the areas of medical equipment development and integrated pest management systems.

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OBJECTIVE: (U) TO DEVELOP METHODS FOR MOSQUITO CONTROL WHICH INTEGRATE PHYSICAL, CHEMICAL, AND BIOLOGICAL CONTROL METHODS, AS APPROPRIATE TO THE TARGET, SO AS TO MAINTAIN EFFECTIVE CONTROL ECONOMICALLY WITHOUT UNDUE DAMAGE TO THE ENVIRONMENT. TO PROVIDE BASELINE LABORATORY DATA AND INFORMATION ON THE EFFICACY OF VARIOUS INSECTICIDES TO MOSQUITO LARVAE FROM WHICH FIELD APPLICATION RATES AND METHODS WILL BE DEVELOPED. EXPERIMENTAL FIELD TRIAL RESULTS WILL THEN BE INCORPORATED INTO IN-PLACE VECTOR CONTROL PROCEDURES USED BY PERSONNEL IN ARMY PREVENTIVE MEDICINE TOE UNITS.

APPROACH: (U) THE MOSQUITO PROBLEMS AT A US ARMY INSTALLATION WILL BE DEFINED USING PREVIOUSLY ACCUMULATED DATA AND ON-SITE OBSERVATIONS. PROPOSED STRATEGIES FOR CONTROL OF THE PROBLEMS WILL BE DEVELOPED. THESE STRATEGIES WILL INTEGRATE PHYSICAL, CHEMICAL AND BIOLOGICAL METHODS AS APPROPRIATE TO THE PROBLEMS AND AS APPROPRIATE TO PROJECTED RESOURCES FOR PEST CONTROL. THE PROPOSED STRATEGIES WILL BE IMPLEMENTED ON-SITE TO TEST THE INTEGRATED PEST MANAGEMENT CONCEPT AS IT APPLIES TO MOSQUITOES. CONVENTIONAL PEST MANAGEMENT METHODS WILL BE USED AS A BACK-UP, IF THE PROPOSED STRATEGIES PROVE INEFFECTIVE.

PROGRESS: (U) 8010 - 8109. SETTLING STUDIES WITH BTI HAVE SHOWN THAT THE RATE OF PRECIPITATION IS DEPENDENT ON THE LEVEL OF SUSPENDED PARTICLES PRESENT. FIELD TRIALS, USING DOSAGES RECOMMENDED ON THE MANUFACTURERS LABELS, RESULTED IN 93 PERCENT PLUS LARVAL MORTALITY. THE TEST DATA SUGGEST THAT THESE DOSAGES ARE RELIABLE IN PRODUCING HIGH MORTALITY. PARALLEL BIDASSAYS WITH BTI AND A DEVELOPMENTAL GROWTH INHIBITOR (IGR) REVEALED THAT THIS COMBINATION WAS SLIGHTLY MORE THAN ADDITIVE IN TERMS OF LARVAL MORTALITY.

PROCESSING DATE: 28 FEB 82 DD . FORM 1498M

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DTIC FORMAT 850

TITLE: (U) Integrated Pest Management - Mosquitoes

FUNDING HISTORY: PY - 0; CY - 157K; BY - 88K

PROBLEM DEFINITION: Rapid advances are being made in insect pest management technology in the civilian sector. Among those not yet fully capitalized on by military pest management are ultra-low volume pesticide dispersal technology, controlled release and microencapsulation formulations, use of hormone analogues, and the impending availability of effective, economical biological control agents for mosquitoes and blackflies. While evaluation and assimilation of some of this technology by the Army is under way, a context is needed in which to tie together conventional and developing technology into an integrated pest management system for use by the military to control mosquitoes efficiently, economically, and with minimal environmental insult.

IMPORTANCE: Vector control is the only way to protect the American fighting man from many vector-borne diseases. Military medical history demonstrates that protection of troops from vector-borne diseases may be vital to the outcome of armed conflict in many parts of the world. Therefore, it is of critical importance that insect pest/vector control technology in the military be developed and maintained at the highest state-of-the-art. The requirement that insect pest management be done with minimal environmental insult in CONUS and in host countries where host-country agreements so specify focuses special attention on hormone analogues and candidate biological control agents.

APPROACH: Field study areas will be identified at which developing mosquito control technology can be evaluated for suitability for use by the Army. Of immediate interest are hormone analogues and biological control agents nearing commercial availability.

ACHIEVEMENTS: Several field studies utilizing three formulations of the insect pathogen Bacillus thuringiensis var. israelensis were conducted. All were extremely efficient in effecting mortality of the target species.

RELATIONSHIP TO CORE PROGRAM: This project is a systematic approach to providing a vector control program for management of mosquitoes. Project is in keeping with mission for research in applied military vector control.

MANUSCRIPT: Simulated Field Studies with Four Formulations of <u>Bacillus</u> thuringiensis var. <u>israelensis</u> Against Mosquitoes: Residual Activity and Effect of Soil Constituents, Van Essen, Frank W., and Stephen C. Hembree. For publication in Mosquito News.

HEALTH HAZARDS OF MILITARY MATERIEL

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TITLE: (U) Field Provision of Nonpyrogenic Water

FUNDING HISTORY: PY - 0; CY - 24K; BY - 20K

PROBLEM DEFINITION: To ascertain the feasibility of off-the-shelf technology for the production of nonpyrogenic water in a field environment.

IMPORTANCE: If generation of nonpyrogenic water can be accomplished in the field, it will alleviate a large logistical burden on the resupply of parental solutions.

APPROACH: A treatment train consisting of turbidity filter, reverse osmosis, ozonalysis, fluidized carbon bed, ion exchange, pyrogen filter and a 0.22 um filter will be evaluated.

ACHIEVEMENTS: The above materials have been received with the exception of the reverse osmosis unit which was back-ordered.

RELATIONSHIP TO CORE PROGRAM: This research is under the Director of Occupational Safety and Health and the Program Area Manager for Field Water and Sanitation. The research relates directly to the field soldier.

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